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The Physiotherapy Review

Volume XIV Number 6

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The Evolution of Physical Therapy in Mental Diseases

Francis J. Braceland, M. D.*

Physical therapy and psychiatry are somewhat akin in many ways. Both were being practiced long before they were dignified by the names that they now bear. Both have had rather a stormy time of it before reaching their present high level, Both of them contain promises of greater things, and, sad to relate, both branches of science so mutually interdependent require careful guarding and nurturing lest perhaps they fall into the hands of unqualified persons who will cause us to blush with shame at some of the wild and extravagant claims that they might make.

We can with little effort trace both branches of science back to ancient Greek and Roman times. People became distraught and were looked upon as possessors of demons in those times, while I suppose hydrotherapy began on the day that someone discovered that he could fashion a vessel of water large enough to immerse himself. There was a soothing effect to the bath and a feeling of relaxation during the massage that followed (such as it was), the work being in the hands of slaves. Then followed the annointing of the body with oils, and the feeling of well-being was almost complete.

It is true that physical therapy, even in this embryo form, was not hooked up with any form of treatment; there was not enough knowledge or consideration at the time to treat mentally ill people humanely. The disease was not regarded as an illness at all, but rather as a visitation of the gods and the work carried out accordingly. The history of psychiatry at that time and for many years since has been a history of mans' inhumanity to man.

Physical therapy in any form could not be considered as long as mental disease was thought to be possession by demons and evil spirits, and that was the case. Sacrifice had to be offered in the Temple of Saturn and, alas, only too often was it human sacrifice that was offered to propitiate the angry gods. It was the wisdom of Hippocrates, the father of modern medicine, that colored the second great epoch, and he scoffed at both the theories of the cause of the disease and the method of treatment. He ridiculed the idea that epilepsy was a sacred disease and said that it was just the same as any other disease. But still they were not ready to treat the patients. Physical therapy, or any other type of therapy, was not even considered. In fact, Titus, who was a physician at that time, had rather the invidious reputation of recommending stripes for these poor wretches. Even the great Galen, who lived at this time, went astray when he wrote about mental diseases being caused by different humors and thought that equilibrium was kept only by a proper mixture of a moist and dry humor.

The third great epoch into which psychiatry can be divided covers approximately the years 200 A. D. till 1500 A. D. In the early part of this period there was regression. Rome was overcome by the Goths and it was necessary that people pay attention to self-preservation. In times of strife such as these very little is ever done in a scientific or artistic way. As we come toward the Middle Ages, however, there was the dawn of treatment which was somewhat more humane than ever before. It is now, and has been, the custom to slur the Middle Ages, pass over them as the Dark Ages, and look with pity upon the people who lived in these times as poor benighted souls. To anyone who would say this, I protest and ask that you submit your proof. I ask any one to point out a century as rich as the thirteenth century in artistic, humane, and scientific approach combined.

For any condition at which you might look askance, we will show you its counterpart today in these enlightened cities of ours. It is true, they believed in spiritualism, but so do some of our scientists of today and yesterday. Alfred Russel Wallace, the associate of Darwin; Lombroso, the great Italian criminologist; Sir William Crooks, the inventor of the Crooks tube—the precursor of the X-ray—and Sir Oliver Lodge, whom you all know, are all dabbling in spiritualism.

It was also within this era that the Bethlehem Royal Hospital was opened, the very first institution ever to open its doors to the insane. The name later got to be contracted to Bedlam, and hence the origin of that term. Shakespeare speaks of the noise of the Bedlam beggars as they went about the streets collecting alms. Yes, it was true, they supported themselves. The revenue of the institution was derived from the fees which were charged to people who would come on holidays to see these unfortunates perform and to be amused at their antics. If we are asked was this humane treatment, we would hastily answer no, but with the same thought remember that not far from this institution not many years ago people were admitted on Sunday afternoons for the payment of twenty-five cents to watch curiously and jibe at these poor wretches much as they would captive animals at a zoo. Do you recall what I said about man's inhumanity to man?

Read before the Pennsylvania Physiotherapy Association, Oct. 5, 1934.
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The fourth period, covering approximately from 1500 to 1800, was a period of reform and awakening. Many and varied were the types of treatment of psychotic patients, but, try as I may, I cannot recognize anything that might be classed under the heading of physical therapy. In 1667, Denis of Paris introduced the transfusion of blood and advocated this form of treatment for a love-sick youth (no doubt a depressed young man). This resulted fatefully and the young man died and damages resulted. It is interesting to note that we have recently started this type of treatment in our hospital (though not for love-sick youth). We would not have time for that. In the United States, especially in Salem, there was an era of witch burning. It was a perfect example of mob hysteria and many were the hapless wretches who were burned because of some peculiarity (the finding of the witch's claw). The whole mob seemed to be obsessed. Well in our country today, with its boasted civilization, women are allowed to die in childbirth, a diphtheritic child be refused antitoxin, a man lose his eyesight, contagious diseases become epidemic because relatives and friends of a patient follow a cult which denies the very existence of disease. Verily, we have not advanced very far.

We have gone thus far and still no attempt to use physical therapy at all. In fact, the therapy is at an extremely low ebb. Let us now come up to a time which is a little more familiar to us. You all know from your early history of Philadelphia how the Pennsylvania Hospital was founded, and how after much correspondence and a misunderstanding between the then sitting board of managers and William Penn, that the hospital was opened in 1756. Now here is the birth of American psychiatry because the hospital took in "lunaticks." It is true that they were still treated like step-children and kept on the basement floor which was half underground. The patients of the medical and surgical departments were on the first and second floors. The insane patients wore what were called mad shirts, which were canvas contrivances much like the canvas sometimes known as a strait-jacket, which is rapidly becoming mere memory in more enlightened communities. The keepers carried whips and did not hesitate to use them on the patients. At first the patients were allowed on the grounds, but the visitors annoyed and jeered at them. Benjamin Rush told them how wrong this was and a fence was built around the grounds. May I here digress for a few moments and tell you of several interesting bits of news which you may have seen in the magazines? Did you know that in several zoos they had to take the monkeys out of the open cages and give them a rest to prevent nervous breakdown from the visitors? In the Bronx zoo the wolf had to be removed to a covered cage because of the people who sang "Who's afraid of the big, bad wolf?" The poor animal lost weight, refused food, and had to be isolated.

The ground for this institution (Pennsylvania Hospital for Mental Disease) was brought in 1838, 115 acres for approximately $35,000. The building was completed in 1841 and Dr. Kirkbride appointed in about 1843.

In 1841 the hospital day began with a bell at four forty-five in the summer and five-fifteen in the winter. At this time attendants unlocked chamber doors and gave the occupants a cheery good morning. Breakfast at six-thirty was followed by physician's visit. There were then hours for diversion, occupation, rest, dinner, resumption of rides, walks and propelling one's self around on the circular railway. Tea was at six and after tea every night a physician's visit, and every night a lecture or entertainment. The charge for private patients was $3.50 for Pennsylvanians and $5 (weekly) for those from out of the state.

REGULATED AND PRESCRIBED MEASURES

The value of prolonged neutral bath for producing quiet and sleep in certain nervous conditions, hysteria and mild anxiety states has long been recognized. Brierre de Boisment in France, and Scholtz in Germany, employed modified continuous baths for excited patients many years before Kraeplin's observations and emphatic approval brought this method more or less into general use.[2] Just seventy-five years ago Dr. Isaac Ray visited the important hospitals for the insane in Great Britain, France and Germany and the following reference is gleaned from his tour notes: "Nothing is so much relied on, especially in France, for subduing inordinate excitement, as the warm bath protracted for an hour or two."

When the time of the bath is protracted beyond the usual period but does not exceed two hours it is generally spoken of as prolonged. When it occupies more than two hours it is spoken of as continuous.

About thirty years ago Kraeplin noticed that confused, restless and debilitated patients were greatly benefited by several hours spent in a warm bath. He gradually increased the treatment time to an entire day and finally the unsatisfactory condition of his excited patients during the untreated or night period led him to attempt the experiment of a really continuous or "Dauerbad." Patients are now frequently kept in the baths for weeks or even months without any untoward results.

The effect of the "Dauer-bad" on the physiologic processes of the body is but little understood. Our observations on the blood pressure, pulse and respirations, recorded over a period of six months, show no variations from the normal. There is some experimental and considerable empiric evidence to prove that the continuous bath acts as a mild hypnotic agent and that, unlike drugs, it induces physiologic fatigue without the sacrifice of mental capacity. You will understand that this is exactly what we want.

The estimate of just how much any isolated therapeutic measure, be it physical therapy, music or occupational therapy, contributes toward recovery from such a complex pathologic condition as is presented by insanity, must of course be purely speculative. It would be unfair and even incorrect to say that the continuous baths cure or even definitely shorten the course of any psychosis. That they constitute an extremely valuable and efficient method of controlling excited states cannot be denied. Probably the best results were obtained in conditions of confusion and restlessness frequently associated with considerable physical debilitation. The infective exhaustive group furnishes an excellent illustration of this type. After five or six hours in the tubs the majority of such patients become drowsy and often fall into a sound slumber shortly after being placed in bed. Some clinicians advocate sleeping in the tubs, but we believe that after a state of somnolence is reached the patients should be placed in bed. Abnormal mental exhaustion is closely simulated by extreme body fatigue and while in the latter nature readily supplies the sovereign remedy, sleep, in the former it must be produced by some artificial means, as the pathological condition of the nervous system precludes the possibility of a normal response to physical weariness. Hypnotic drugs given in doses large enough to produce sleep are objectionable because they place an added burden on the already overtaxed nervous system. Moist packs are at times objec-

tionable because of the resistance that they frequently offer to the motor restlessness that accompanies this apprehensive confusional state. On the other hand, the continuous bath relies for its therapeutic action solely on water, a non-resistant medium which favors rather than retards excretion and it is better than drugs because it is gradual and sedative rather than rapid and hypnotic, The manic phase of manic depressive insanity responds to the continuous bath in something more than half of all cases. No restraint is necessary and to use it is to defeat the purpose for which the bath is given.

UNTOWARD EFFECTS

It should be here noted that the Pennsylvania Hospital uses no form of restraint while the patients are in the tubs. There was an unfortunate accident reported by one physician in another hospital about ten years ago in which a patient who was restrained in a tub was scalded to death. Now it is true that so potent a weapon for good could be a source of evil also. However, if there had been someone present in the room, as is demanded in our hospital and had the temperature of the water been watched, this would be rendered unlikely; therefore the patient must never be tied in the tubs and left alone. Some suicidal patient would take this long looked for opportunity to destroy himself. Otherwise untoward effects from the continuous bath treatment have been nil. At times there are fleeting vasomotor disturbances chiefly manifested by flushing, but these disappeared after a short time and had no further significance. Kraeplin regarded any form of middle ear disease as a contraindication. Most clinicians interdict the baths during the menstrual period. After the menses have been well established, however, there seems to be no good reason why a greatly excited patient should not be given moderate tub treatment. Advanced cardiac and pulmonary disease are prohibiting conditions, but even markedly arteriosclerotic patients have not shown any ill effects.

This form of treatment is used in some general hospitals, and rightly so, in the treatment of alcoholic states and delirium tremens. After all, alcoholic delirium is essentially a toxic psychosis in which the psychomotor activity, though more intense, does not differ materially in its characteristics from some of the fevers and some of the so-called delirious mania. There is, after all, the same need of free elimination to reduce toxicity and sleep to prevent exhaustion. Hypnotic drugs, if they are to succeed at all, must be given in huge doses which are dangerous. In one hospital ten unselected patients with delirium tremens were treated in the continuous tubs with the addition of moist packs and eliminatory measures without a single fatality. Fifty cases selected at random in a series of ten, from five general hospitals in which the method used consisted of mechanical restraint, hypnotic and stimulating drugs, showed a mortality of 26%. I commend this to your attention.

MODERN METHODS

Modern recognition of the importance of physical therapy is shown by the formation of the Council on Physical Therapy of the American Medical Association, by the time alloted by some medical schools on the curriculum, and by the organization and expansion of physical therapy departments in general and special hospitals. In a paper read at the American Psychiatric Association meeting in 1932[4] the following interesting figures were brought to light: Out of one hundred institutions questioned, only five reported the use of no physical therapy and eighteen confined their activities to hydrotherapy alone. Contrast this with the figures of twenty years ago and it comes in the nature of a surprise. The median duration of the employment is eighteen years, and seventeen institutions have used hydrotherapy thirty years and one over seventy-five years. The average equipment is six continuous tubs, one or two hydriatic outfits consisting of Baruch control tables with spray needle shower, size baths, Scotch Douche, and ten pack tables. In addition, eight institutions have whirlpool baths, colonic irrigation equipment; five, swimming pools; three, vapor or steam baths. The average hospital gives about one thousand treatments to about one hundred patients per month, and three reported more than five hundred treatments per month. Of course, in some regions hydrotherapy had to be discontinued because of the water shortage.

Heliotherapy is a valuable adjunct in our hospital and is used as an adjunct in the treatment of involutional and depressed patients with photodyne, a drug which is made from the breakdown products of hemoglobin. After the injections and ingestion of the drug, it is necessary that the patients be given heliotherapy because we believe that this activates the drug. For further information on this subject you may consult Dr. Strecker and Dr. Palmer, and the author's paper which appeared in the March number of the American Journal of Psychiatry.

In the past year in our hospital we have been trying out the theories of Bernard Aschner, a Viennese physician who has attacked the dreadful disease dementia praecox which has rendered useless so many brilliant minds. One of the adjuncts which looms large in this treatment is some forms of physical therapy. In all of these patients there seems to be a sluggishness and a lowering of all metabolism. In this treatment the attack is centered on this fact and the individual is put into a bath and massaged for the entire time that he stays there. The temperature of the water, which is ninety at first, is lowered to seventy and massage is continued and thus a sluggish skin is stimulated. The individual is given daily sweats of some kind, either in the cabinet or in packs. So far, the results have been quite encouraging and certainly justify our continuing. It would do well to quote Aschner in a paragraph in which he finds fault with the clinician for not using these remedies. "Hydrotherapy seems to be too unscientific and simple for many a learned specialist; nevertheless, its effect is dissimilarly versatile and more curative than other applications. It may be said that within a short period energetic hydrotherapy will again be regarded as one of the most valuable and indispensable accessory remedies in the treament of the psychoses."

There you have the dictum of one of the forward looking men in the science today. It must be encouraging to you to know that physical therapy has a place in the most advanced treatment known to psychiatry.

Now in this rambling talk I have purposely omitted many valuable things which come under the heading of physical therapy. Corrective exercises, swimming and the myriads of electrical treatments that you have in your repertoire, I am confident that each one plays an important part as an adjunct in the treatment of mental patients. Time does not permit nor am I qualified to discuss these things with you.

Another important thing is the attitude of the therapist. I consider this most important—the therapist should have some knowledge as to what is to be accomplished by the treatment. The attitude should be one

of interest and helpfulness. No one is as quick to sense the feelings of a therapist as a mental patient. Nothing is to be accomplished if the worker goes about the treatment in a matter of fact, routine manner. Every consideration is necessary for these patients, although it is superfluous to tell you that they can be most trying. For a therapist or a physician to be irritable or cross is a confession that he does not know what to do next. Warmth of feeling, real or assumed, coupled with a genuine interest is an absolute necessity or your work is to no avail.

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The Treatment of Burns

S. J. Seeger, M. D., and Arthur A. Schaefer, M. D.

For untold centuries man has held a distinguished place in the animal kingdom by his ability to produce fire. It has been one of his greatest blessings, yet at times it becomes a most formidable enemy. All of us know that burns occur all too frequently in our modern civilization, and the fact that most of these accidents are preventable is no credit to our intelligence. Almost fifty per cent of all household fatalities which occur under the age of fifteen are due to burns and scalds. This fact alone should impress on everyone the importance of the treatment of these painful and disfiguring accidents. Every home should be the center for a prevention campaign. The problems which I wish to emphasize in this paper, however, are the treatment of severe body burns and the restoration of body function.

Many methods have been advocated in the treatment of burns; in fact, some centuries ago nearly every wound was converted into a burn by the application of the cautery or boiling oil. The resulting burn was then treated with all sorts of oils and weird concoctions. There could be no rational treatment until infection was understood and until the reactions of the body after thermal injury had been studied. The first radical departure from treatment with oils and ointments was that of Passavant[1] in 1858. He used submersion baths. Copeland[2] in 1887 and Sneve[3] in 1905 treated their patients with nothing but the open air. Then followed probably the most widely used method up to the present day, that of Barthe de Sandfort,[4] who introduced the paraffin wax or "ambrine" method in 1914. One of the modern and most popular methods today is that devised by Davidson[5] in 1925. This treatment consists of applying a tannic acid solution to the burned area to obtain a firmly attached membrane which does away with frequent painful dressings.

To illustrate this method I shall describe the procedure used at the Milwaukee Children's Hospital. When the patient is first seen he is usually in some degree of shock. This primary shock is similar to that which follows trauma or the loss of blood; it is treated by heat, forced fluids, transfusion and stimulants. A large dose of codeine is usually given. The clothing is carefully removed and the burned area cleansed with soap and water, and if some oil or ointment has been applied as an emergency measure, ether is used to remove it. All blisters and devitalized tissue are removed with sterile instruments. Then the tannic acid solution is sprayed

From Milwaukee Children's Hospital, Milwaukee, Wisconsin.

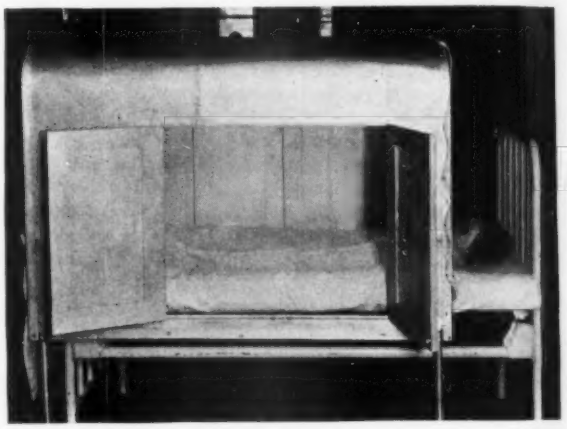

Fig. 1. The type of heat tent used at Milwaukee Children's Hospital. Note the doors on either side which allow free access to patient without removing tent. When in use there is no covering over patient.

Fig. 2. View of heat tent to show series of lights to raise the temperature. A canvas covering fits over the end, and only the patient's head is outside. A thermometer is kept on the bed and in the upper part of tent to check the temperature.

over the area every fifteen minutes with an atomizer. We use a five per cent tannic acid solution which has been neutralized to a pH 7.4 by the addition of sodium carbonate; 3,975 grams of pure anhydrous sodium carbonate and 25 grams of pure tannic acid in 500 c. c. of water will give such a solution. This was introduced by Seeger[6] in 1932. We use this neutralized solution because we believe that a more uniform "tan" is obtained with less edema of the underlying tissues. The mildness of the reaction of this solution allows delicate epithelial islands to persist when they might be destroyed by the more violent tissue reaction in the treatment with ordinary tannic acid solutions. The spraying is continued until a light chocolate brown membrane is formed over the burned area. This takes from eight to twenty-four hours. All of this time the patient is kept in a heat tent in which the temperature is maintained at about 98° F. All patients who have ten per cent or more of the body surface involved are given a blood transfusion within the first forty-eight hours. Large amounts of fluids are given daily with generous amounts of sodium chloride. The chloride is usually given intravenously in the form of normal saline solution. This is given because the blood chlorides are markedly reduced in severe burns. The fluid intake should be 4000-6000 c. c. daily. In children 2000-4000 c. c. of fluid is sufficient.

After about a week the tanned membrane begins to loosen at its edges. If no infection has occurred in the burned area no further treatment is necessary and the edges as they loosen are removed with sterile scissors. The epithelium will have grown in at the edge. If infection occurs, it is usually apparent by the fifth day and the entire membrane should be carefully studied to determine if pus is present underneath. When suspicious areas are found they should be incised and the "tan" removed. The whole membrane is then gradually removed with hot sodium bicarbonate packs and there is left a granulating surface. At this stage one is confronted with the second critical period in the treatment of severe burns. Many patients die during the second to the fifth week after severe burns from secondary infection and apparently an exhaustion of the assimilating and restorative processes of the body. The mechanism of this lack of response is totally unknown. Infected granulations are treated with hot moist packs of sodium bicarbonate or boric acid. The sodium bicarbonate is preferred because it does not seem to have the same tendency to stimulate exuberant granulations as does the boric acid, and an alkaline field is much more suitable for successful growth of skin grafts than an acid one. If the growth of granulation tissue is too profuse, it is treated with strong silver nitrate solution or silver nitrate stick. As soon as this granulating surface is suitable for skin grafting, small deep grafts are placed on the granulations. This is done as early as possible because we believe some of the deep and a great deal of the superficial scar tissue is avoided. It also covers over large granulating areas rapidly before they become grossly infected. The dressing at the time of skin grafting is left on until the secretion is too profuse or the odor becomes disagreeable. At the second dressing, if the granulations seem infected, hot dressings are again resorted to. Ultra-violet light treatments are given to stimulate epithelial growth. Scarlet red ointment is used for epithelial stimulation when the area is relatively clean.

In burns involving joints one always has the problem of avoiding contractures and restoring function. During the past year we have not used splints and traction methods as much as formerly, because we feel that the most disabling and deforming contractures resulting from burns take place after the burned area has healed over. We feel that covering over the granulating areas with epithelium as rapidly as possible does more to prevent the formation of contractures than any other factor. It does not solve the whole problem, however. These patients must be under the supervision of a physical therapist for months after discharge from the hospital. Scar tissue will continue to contract for three to six months, depending upon the individual. Physical

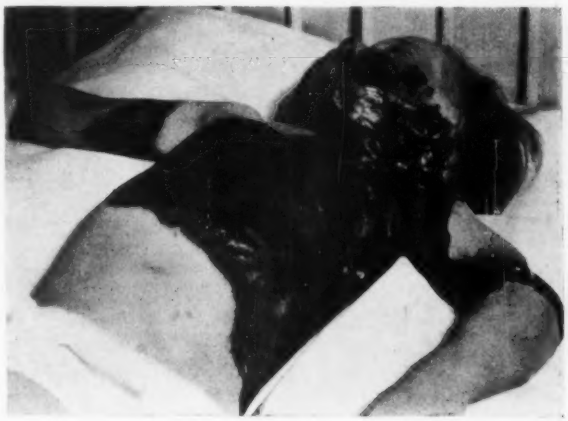

Fig. 3. Three year old child with a burn of 37% of body surface. Tannic acid solution has been applied. Note the firmly attached membrane.

Fig. 4. A 10½ year old boy with burn of 20% of body surface. The "tan" is off and skin grafting has begun. Note how the epithelium grows out from the small skin grafts.

Fig. 5. A patient with contracture following burn. No skin grafting was done. Several plastic operations were necessary to give this boy a better result.

therapy must be kept up for this length of time to accomplish any permanent result.

After this period one must consider plastic surgery in two types of cases: (1) where greater function is desirable, (2) where a better cosmetic result may be expected. One cannot formulate any set rules for the type of case in which plastic surgery is necessary nor the kind of operation to be used, because the deformities from severe burns are infinite in number and character.

There are other problems which present themselves as complications, such as Curling's ulcer, which may occur anywhere in the gastro-intestinal tract but most commonly in the duodenum. They usually are found early, within the first ten days after the burn. After burns of extremities with formation of annular scars, stasis of either blood or lymph may occur and elephantiasis sometimes results. The most important complication to the physical therapist is the persistent ulcer which sometimes occurs in dense scar tissue following extensive burns. Much can be done in the treatment of these ulcers with massage and exercise. Early skin grafting will prevent their formation.

This outline of the treatment of severe body burns has been necessarily brief, because all of the problems presented by these accidents cannot even be approached in so short a paper. However, we wish to impress upon our readers the fact that the treatment of these cases can best be carried out by close co-operation of the internist, surgeon, and physical therapist.

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The Mechanical Aspects of Visceroptosis and the Place of Exercise in Treatment

Katherine R. Rambo

FOREWORD

So frequently is visceroptosis a part of the picture of malnutrition, secondary anemia and physical and mental fatigue, that it is impossible to consider this condition from the point of view of treatment without considering the treatment of associated conditions.

I was delighted on reading this paper to find that it definitely outlines the factors playing a part in the picture of visceroptosis and gives the fundamental principles on which to base the treatment of each case as an individual problem. It does not over-stress the value of correct body mechanics, but does emphasize the correctness of posture as an important part of the treatment.

There often is failure in obtaining good results in this type of case because of lack of cooperation on the part of the physician and the physical therapist. This lack of cooperation I believe is most frequently due to ignorance of the disease as it effects the physiological function and anatomical structure of the body.

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It is most gratifying to physicians to learn that teachers of physical education are studying body mechanics with the idea of correcting the defects present in so many of our young people of today. Good body mechanics will not only lead to greater efficiency in work and play but also to better health.

Frieda Baumann, M.D., F.A.C.P.

Man's lineal ancestors were creatures who progressed as quadrupeds, the body weight distributed over a broad base and resting upon four supports. Man's erect posture is the result of many thousands of years of an evolutionary process. Through these years during which man slowly assumed an upright position, the body weights necessarily shifted, and man developed into a biped with a narrow base of support. At this time the force of gravity and the element of balance became problematical factors. By this change man increased his potentialities in the intellectual and in certain highly spe-

cialized physical fields, yet this was accomplished at a considerable mechanical disadvantage which manifests itself in the marked prevalence and wide variety of disturbances in visceral function. This seems to indicate that from a mechanical standpoint at least, man's adaptation to the erect position is, even at best, incomplete and inadequate to meet his needs.

A detailed study of living anatomy is essential for an intelligent approach to this problem, yet the study of living anatomy has been greatly neglected. We are apt to be misled by the fact that the cadaver, upon which anatomy has been written and taught, has died in the horizontal position and in this position the tissues have become fixed.

Dr. Dickson[1] calls attention to the following examples of maladjustment to the upright position—

1. In the horizontal position the blood flows comparatively evenly and easily from both anterior and posterior parts of the body. When the erect position is assumed, gravity becomes a factor, and the blood returning from the lower abdominal cavity, the pelvis, and the lower extremities, is retarded, whereas that from the head is accelerated. We can readily see that in the erect position the labor of the heart will be greatly increased.

2. In the horizontal position the ribs hang in easy balance from the vertebral column and there is no mechanical hindrance to their freedom of motion—therefore the chest cavity can be increased in size with very little muscular effort. When this same general structure is turned into the upright position the very architectural arrangement causes strain at the costo-vertebral articulations, and a considerable amount of muscular energy is required since the entire weight of the chest wall must be lifted with each inspiration. This mechanical interference with the mechanism of breathing is a serious one.

3. The region which probably has undergone the greatest change in this evolutionary process is the abdominal cavity. In the horizontal position the viscera rest compactly against the ventral wall, a position which favors efficient functioning. When the upright position is assumed, it is easy to visualize what takes place. Although the organs are supported to some extent by ligaments and mesentery, gravity forces them downward and there is likely to be pressure on those below from those which are superimposed upon them.

Visceroptosis was formerly regarded as a distinct disease, but it is now considered as a symptom group which is an indication of a general constitutional disturbance characterized by laxness of the mesenteric and peritoneal attachments so that the stomach, intestines, liver, spleen and kidneys occupy an abnormally low position. It is associated with atony or asthenia of most of the smooth muscles of the body. In other words, visceroptosis is a part of a picture, not an entity in itself.

"It is a condition which is wide spread, not confined to any class, nationality, age or sex. The floating kidney is found among the Beduin women who live nomadic lives close to nature, where the developmental restraints of civilization and the corset play no part, as well as among women of the most civilized countries where artificial ways of living are so much in evidence. A study of old paintings, notably Botticelli's women, makes it obvious that the condition has existed for centuries."[2]

First let us consider the general plan of the viscera in relation to the abdominal cavity. When man assumed the erect position some form of support for the viscera became necessary so that the circulatory and nerve supply to the lower abdominal and pelvic organs would not be automatically interfered with by pressure from the organs above. Nature has arranged for shelves as supports, using the bones, muscles and intra-abdominal structures to accomplish the plan.

Abdominal boundaries:

Anterior and lateral walls — abdominal muscles, iliacus and lower ribs. Posterior—vertebral column in median line, upper part of sacrum, flaring wings of the ilia, psoas and quadratus lumborum muscles. Above—the two domes of the diaphragm extending under the shelter of the bony thorax—slightly below the level of the fifth rib on the left side, and a little higher on the right. Below—the plane of the superior aperture of the lesser plevis.

The integrity of these boundaries is necessary for the adequate support of the viscera, and this integrity is dependent upon the spine, the ribs, the pelvis, and the musculature of these parts maintaining a balanced relationship. Any weakening of these supporting structures immediately causes these parts to assume an unbalanced relationship.

"The normal backward inclination of the spinal column from the lumbar region toward the thoracic region plays an important role. This backward slope of the spine from the fifth lumbar vertebra upward, results in a rapid widening out of the abdominal cavity from below upward, so that while at the level of the fifth lumbar the depth of the abdominal cavity is only about one-third of the thickness of the body, as far up as the eleventh dorsal it comprises about seven-eighths of the thickness of the body. In outlines then it resembles a truncated cone, large above and tapering toward the bottom. This affords the best architectural arrangement for supporting the viscera. The supporting effect of this backward slope of the spine is greatly increased by the arrangement of the soft parts along its course. At the level of the fifth lumbar the space on either side of the vertebral bodies is almost entirely filled up by the psoas and quadratus muscles and the retroperitoneal fat. The fifth lumbar then, the upper part of the sacrum, the retroperitoneal fat, together with the ilio-psoas and quadratus muscles form the lowermost support or shelf in the abdominal cavity, and upon this shelf rest the kidneys."[1]

On account of its relation to the liver the right kidney begins at about the level of the fourth lumbar; the left kidney is slightly higher.

"The kidney is surrounded by two sheaths, an inner fibrous layer called the true capsule, and an outer so-called fatty sheath or capsule. The fatty sheath is our special interest, being the tissue the framework of which forms the nephrocolic ligament. This passes longitudinally downward and on the right side is inserted into the posterior wall of the ascending colon between its peritoneal attachments, and on the opposite side in a similar manner into the descending colon."[2]

The kidneys incline backward following the backward inclination of the spine, and rest upon the muscles of the abdominal wall, the psoas, quadratus, and the fascia of the transversalis and the diaphragm. This structure forms the next abdominal shelf which supports the liver on the right side and the stomach and spleen on the left.

The liver is the heaviest of the abdominal organs, consequently its support must be firm. It is supported partly by ligamentous connections with the abdominal walls, by an attachment to the inferior aspect of the diaphragm, by the incurving lower ribs, by the backward slope of the spinal column, by the support given by

the stomach, duodenum, transverse colon and other parts of the gastro-intestinal tract, and by the muscles of the anterior abdominal wall.

The stomach, which lies in the upper left side of the cavity just under the diaphragm, is largely supported by ligaments which pass to the diaphragm, but rests to some extent upon the kidney and the retroperitoneal fat, and in the depression on the left side of the spine. The abdominal wall plays an indirect part as a support for the stomach as the tone of its musculature compresses the intestines which in their turn help to support the stomach. The opening from the stomach into the intestines is the pylorus.

Other parts of the gastro-intestinal tract which should be considered because of their intimate association with the general prolapse of the viscera, are the duodenum and colon.

"The duodenum, beginning at the stomach passes right toward the liver, turns sharply downward in front of the right kidney, then turns left passing in front of the vertebral column, aorta and inferior vena cava, then turns upward to join the jejunum. The ascending colon extends from the cecum to the under surface of the liver where it turns left (hepatic flexure) and becomes the transverse colon. This continues to the left in a horizontal direction, passing in front of the pancreas and close to the lower border of the stomach. On reaching the spleen it turns downward (splenic flexure) and becomes the descending colon. It continues downward on the left side and when it reaches the brim of the pelvis it curves like an S (sigmoid colon) and continues in front of the sacrum to become the rectum."[4]

I have gone into considerable detail in description because a thorough understanding of the anatomical structure is necessary in order to appreciate the effect of visceroptosis and the possibility of stasis in these flexures of the duodenum and colon.

The longitudinal axis of the abdominal cavity is in such a relation to the pelvic axis that the thrust of the viscera is downward against the lower abdominal wall. For this reason the maintenance of tone in the abdominal muscles and fascia is of great importance.

Within the medical profession there are variations of opinion. There are those who consider visceroptosis a basic factor in many conditions; there are those who believe that it plays no part of any consequence; but between two extremes there is always a middle ground, a group of persons willing to examine the scientific data of earnest investigators, and this group feels that visceroptosis, a structural anatomic defect, may furnish a causative factor in the disturbance of visceral function.

"Anatomic findings in this type of individual are quite constant. Bryant's three hundred autopsy records show that this type is associated in a large percentage of cases with a narrow chest, abnormal intestinal adhesions, and frequently with ilial stasis.

Bean observed one thousand and two patients and performed three hundred eleven autopsies and found in this type the stomach small, long and J-shaped, and far to the left. The liver was small, low and vertical and far to the right. The colon was long with a low hepatic flexure and a high splenic flexure, and a definitely low placed transverse colon with a long mesentery. Studies indicate that one out of every five belong to this type."[1]

Dr. White,[5] reporting his work on visceroptosis feels that visceroptosis is due to the combination and interaction of two causes: first, congenital looseness of the attachments of the abdominal viscera; and second, habits of poor body mechanics.

1. The constitutional or congenital type has been termed an anomaly of development—a narrow upper abdominal opening, low diaphragm, elongated visceral ligaments, all of which combined lead to a greater or less degree of prolapse of the abdominal viscera.

2. The second or acquired type is largely due to relaxation of the abdominal wall. It may be the result of poor body mechanics, it may follow a prolonged illness or it may be the result of an acute infection. It may be present in the neurasthenic individual as the result of general lowered muscular tonus.

In the following description of the development of the process of ptosis, the quotations are from Dr. Joel E. Goldthwait.[6]

"If the body droops, the shape of the abdominal cavity changes at once. The ribs are necessarily inclined downward, and since the lower part of the rib is below its costo-vertebral articulation, it is inevitable that in the downward movement there is a corresponding backward movement of the anterior portion. This results at once in a material lessening of the space under the ribs, with the effect that the upper abdomen is made smaller than normal. In this position, since the diaphragm is attached to the lower ribs, it also must move down. These two elements, the downward movement of the diaphragm, and the contracting of the space under the ribs, mean that the stomach and liver are crowded downward into other positions."

The stomach may be vertically placed and may reach far below the crest of the ilium. Its motility may be normal, but there may be stasis from associated pyloric spasm, or from kinking of the duodenum.

Displacement of the liver is less common, although occasionally a large surface of lobes comes in contact with the abdominal wall.

"In such an attitude, not only are the ribs flattened and the diaphragm lowered, but since the support of the body is thrown almost entirely upon the posterior muscles, the abdominal muscles become relaxed. This being the case the abdomen protrudes or becomes prominent anteriorly, with the effect that not only is there less support for the organs, but the depth of the abdominal cavity is materially changed, with the result that all the organs tend to assume a lower level." (The ribs usually flatten to a degree corresponding to the advance of the abdomen.)

"In this downward movement or droop of the body, since the posterior attachments of the diaphragm are so low that they come well down behind the upper part of the kidneys, as the diaphragm is lowered the kidneys are necessarily dragged forward at the top. To still further affect the position of the kidneys, since the liver rests partly upon the right kidney, and since undoubtedly there is some pressure upon the left kidney from the stomach, as these organs are forced downward, the kidneys are forced downward also. The continued pressure of the organs from above upon the kidneys naturally results in the absorption of the fat tissue surrounding them, and that portion of their support is taken away.

"In this downward displacement not only are these organs affected, but since the colon, if it has its normal attachment, is attached at the hepatic angle directly under the liver, in this general displacement the movable part of the colon must be forced downward with the result that the angle is made sharper and may very possibly be cut off as the result of pressure.

"On the left side a similar condition occurs as the result of the pressure or drag of the stomach against the left side of the transverse colon, with the resulting interference at the splenic angle."

Nephroptosis, prolapse of the kidney, and coloptosis

or prolapse of the colon with consequent kinking at the flexures, are the most constant phenomena in visceroptosis. The colon may be felt as a tight cord stretched across the abdomen at or below the umbilicus. It may be as low as the brim or even in the pelvis.

When the body is fully erect the axis of the abdominal cavity should be almost at a right angle to the axis of the pelvis. In the relaxed standing position, however, the axes are changed so that the thrust of the organs can be received more directly into the pelvis. The effect of this is perfectly obvious. It means not only interference with these organs by direct pressure, but also interference with their blood and nerve supply. The prevalence of severe dysmenorrhea as an associated factor in visceroptosis is well known to gynecologists. Dr. Clelia Mosher[7] gives precedence to the upright position, inactivity of the diaphragm and poor tone of the abdominal muscles as causes of painful menstruation.

Dr. O. S. Fowler[8] of Denver, has called attention to the importance of adrenoptosis as an associated feature of general visceroptosis. "This results in atrophy or possibly sclerosis of the adrenal glands from the pull upon the vessels. This induces an irritation of the adrenal sympathetic and autonomic nerves. The combined result is inefficient adrenal function, and all this produces a further loss of intestinal tonus which again increases the visceroptotic tendency. Thus a vicious circle is established which constantly becomes more pronounced and the patient becomes a neurasthenic, with numerous manifestations of an unstable constitution. We regard this damage to either the structure or function of the adrenals as the most serious phase of pathology of any structure included in general visceroptosis. The adrenal glands constitute a tissue upon which life absolutely depends—they basically control our health, metabolism, utilization of vitamines, blood pressure, neural and mental balance, and voluntary and involuntary muscular activity. They hold apparently complete control over the continuing balance of the internal glandular system."

It is easily understood then how visceroptosis may interfere with the function of organs. The most obvious disturbance is a mechanical one whereby the passage of food through the gastro-intestinal tract is slowed down and undesirable effects are produced.

In this discussion we are more intimately associated with this problem from an orthopedic angle, yet satisfactory results can be obtained only by considering the patient as a whole.

Symptoms are usually classified under subjective and objective headings.

A. *Subjective.*

1. General weakness and lack of physical vigor and endurance. There is a definitely lowered capacity for physical activity. Some visceroptotic patients have unconsciously adapted themselves to this lowered capacity and show symptoms only when they exceed their constitutional capacity. They then become rapidly exhausted.

2. Constipation. This can be easily understood from the point of view of a mechanical interference in the passage of food through the canal. Later, because of the damming up of fecal matter, we may have the intestinal canal actually damaged by the development of dilitations.

3. Nervous irritability—at times prominent enough to amount to neurasthenia. The most logical explanation seems to be nervous exhaustion which occurs as part of the general exhaustion. The faulty posture results in muscle strain, fatigue and waste of energy. We have therefore a constant drain on the nervous system which becomes depleted.

4. Headache and backache. Headaches are complained of as being located in the occipital region and in the back of the neck; sometimes there is a general tired feeling in the back extending as low as the lumbar region. The headaches may be caused by severe strain and fatigue due to poor body mechanics. At times the headaches are of migraine type, probably due to nervous exhaustion. The element of toxemia of gastro-intestinal origin must also be considered as a factor producing headaches in these cases.

B. *Objective.*

1. Poor body mechanics. All defects should be carefully noted in estimating the physical characteristics of the patient under consideration.

2. Underweight. This may be due partly to inefficient digestion, and partly to improper assimilation of the food taken. Patients who have had a period of recumbency of from six to eight weeks, have been able to gain from eight to ten pounds.

3. Hypermobility of the abdominal organs. This can be demonstrated by careful palpation through the lax abdominal wall.

Treatment of the existing neurasthenia, relief of nervous dyspepsia and gastro-intestinal symptoms, the underweight and secondary anemia are medical problems and I shall not go into a discussion of them. From the medical point of view the important factor is the function of the organs involved, and not especially their position. Even when the greater curvature of the stomach lies in the pelvis there may be no symptoms if the emptying time is normal; on the other hand slight ptosis may cause severe symptoms if the emptying time of the stomach is interfered with.

The circle is often difficult to break in upon. The deficient innervation leads to a loss of muscular tone, the stomach fails to empty itself as it should and the patient suffers from flatulent dyspepsia, often accompanied by hyperacidity. The muscles of the lower abdominal wall also suffer from general lack of adequate nerve supply. We see then the vicious circle—neurasthenia, nerve fatigue interferes with digestion, absorption is deficient, nutrition fails, secondary anemia develops—all this chain of conditions, and then the nervous system fails still further in consequence.

The ideal in treatment from the orthopedic angle is to restore the body as nearly as possible to normal poise, in which the best possible relationship of all its parts exists. In this we must remember that it is impossible to change the general character of the ligamentous attachments. In other words, if the congenital type exists it will always exist. However, no organ whether perfect or imperfect will function at its best if it is working at a mechanical disadvantage. It is a well known fact that even in the congenital type, the patients rarely show symptoms early in life. It is generally assumed that the symptoms which develop later are due to increased pressure which results from the long continued use of the body in the upright position.

"The correction of the body mechanics is comparatively simple at times and can be accomplished with little interference with the individual's regular activity. Whenever the disturbance in poise has been long existent, not only is the relationship between the bones changed, but there is a marked change in the muscle tone of the entire body. The anterior muscles of the body weaken because of disuse, since in the drooped

position the weight of the body is thrown almost entirely upon the muscles of the back. To attempt to improve the position of the body by exercise alone, with such a muscular condition present, means increasing the muscle weakness, to the distinct interference with general recovery. The first step therefore is to rest the parts which have been overstrained, and to stimulate the parts which have been weakened by disuse. This at times can be accomplished by the use of a brace, which not only has for its purpose the relief of the spinal muscles, but also the correction of the poise by the elevation of the chest through forcing the lower ribs forward and upward, and furnishing support for the pelvis and lower abdomen. While the apparatus is being worn, massage stimulating bathing, etc., are of assistance in stimulating the repair processes. As soon as evidences of muscular fatigue have passed, active exercise is begun with the idea of strengthening all the muscles of the trunk so that ultimately the poise of the body can be maintained without artificial aid."[8]

I am not going into a discussion of treatment in severe cases where long periods of recumbency and plaster jackets are indicated. Various individuals and groups who have been working on this problem for a number of years, have built up certain routine methods of treatment.

EXAMPLES OF ELEMENTS EMPHASIZED BY VARIOUS GROUPS

Brown and Talbot—Harvard:[9]

As the child tires easily he needs rest, a week or more in bed. Particular attention is paid to the correction of general posture. While the child is in bed a pillow is kept under the lower dorsal and lumbar region. Simple breathing exercises for expanding the chest are given. Practices correct standing and walking position several times each day.

St. Bartholomew's Hospital—London:[10]

The lower ribs are carefully expanded until the lower costal region is in line with the axilla. This expansion automatically supplies room for the large viscera. The original accommodation cannot be regained without a deliberate development of the lower costal region. The abdominal muscles are made to contract almost to the spinal column, and with the aid of the operator's hand, the organs are pressed upward. The rectus abdominis, transverse and oblique muscles become extremely powerful by daily exercise, and are a valuable asset in helping to support the viscera which gradually assume their normal positions.

Treatment with the operator—forty minutes; reduced gradually to about ten minutes without the operator.

Dr. Fritz Lang[11] places emphasis upon strengthening the gluteus maximus and other hip extensors, which he feels have become elongated.

Dr. George Wagoner's theory has been explained carefully by Dr. J. Blair Fitts:[12]

The whole principle of treatment has been put on a firm and indisputable basis by proving that there is normally a negative intra-abdominal pressure, and that this pressure is markedly increased in the splanchnoptotic when assuming the erect position, returning to normal when recumbent. The negative pressure is influenced by respiratory movements, and more by the tone of the abdominal muscles. This increase in negative pressure, according to Dr. Wagoner, explains practically all the symptoms. With an increase in pressure there is an engorgement of the whole abdominal and pelvic circulation, which when long continued, not only tends to give trouble in this region, but at the same time drains and deprives the whole peripheral circulation of the necessary blood supply. The systolic pressure is lowered and the patient soon feels tired and unable to carry on his work. With recumbency some of the pressure is relieved, and a more normal state of circulation is set up.

Following the findings of Wagoner to their logical conclusion, the treatment is simple—correct as much as possible the loss of tone of the abdominal muscles, at the same time giving support, and correcting the general posture; in other words—restore normal body mechanics for the individual under consideration.

Drs. Mengert and Murphy[13] have done some interesting work in experimenting with intra-abdominal pressure created by voluntary muscular effort.

Dr. John B. Carnett[14] placed emphasis upon the muscle tone of the abdominal wall, and upon the necessity of freeing the intercostals from strain.

Dr. W. A. Cochrane[15] states that in some instances, sugar, and albumin in the urine, due to functional disturbances in the pancreas or kidney, was not influenced by diet but disappeared upon the correction of poor body mechanics.

In general then, the place of exercise in the treatment of prolapse of the abdominal viscera seems to be accepted as an important one. I am not presuming to give you, who are specialists in body mechanics, a list of exercises to be used, I am merely outlining the fundamental principles involved in visceroptosis, and the place of exercise in treatment.

Because of the general anatomic structure of man, we cannot reasonably isolate one part for correction. For instance, the stomach and liver are attached to the diaphragm, the suspensory ligament of the diaphragm is the pericardium, especially on the right side, and this is finally attached to the anterior aspect of the cervical spine. It is true that we may improve to some extent the tone of the musculature of the abdominal wall, and we may make some gain in chest expansion, yet, if in the habitual standing position the individual carries the head forward so that the cervical spine is not fully extended, then all the effort spent on the other parts of the body is of no consequence. The fundamental principle then is that we consider the whole person, treat the whole patient, not just one group of muscles. The process is one of balanced inter-relationship—the correction of one element will not influence the individual as a whole.

THE FOLLOWING ELEMENTS ARE NECESSARY FOR GOOD MECHANICAL BALANCE

1. An inversion of the feet and integrity of the arches to insure a stable base of support at the calcaneus.
2. There must be a balanced muscular and ligamentous pull at the knee joint—between the upper ends of the tibias and the lower ends of the femora. In this way the body weight can be supported with the minimum amount of muscular energy.
3. Adduction and inward rotation of the heads of the femora in the acetabula. In this way the weight of the pelvis will be received with the least strain.

There seems to be considerable variation in the angle of the neck of the femur to the plane of the femoral condyle, but in general, in standing and in walking the best equilibrium will be secured when the inner borders of the feet are kept nearly parallel.

4. A balanced adjustment of the fifth lumbar vertebra and the sacrum, thus reducing the tendency to lordosis. Lordosis is not a constant feature of visceroptosis, but visceroptosis is usually present in individuals with markedly lordotic spines.

5. The abdominal wall is firm and flat.

6. Extension of the thoracic spine. This reduces the pull of the ribs on that portion of the spine, and releases the erector spinae and intercostals from strain.

There must be the greatest possible depth of the thoracic cage, the sternum the part of the body farthest forward, and a broad sub-costal angle.

7. Reduction of all spinal curves to what would be within normal for the individual under consideration—this also lengthens the axis of the spine.

8. The head is up, chin in. This affords best extension for the cervical spine and also unrestricted blood supply to the brain.

"Exercise can be of great benefit to these patients, but it must be carefully chosen or satisfactory results cannot be accomplished. Exercises must be carefully graded so that the weakened tissues will be raised in tone and endurance slowly, steadily and surely, without strain or fatigue. While special exercises are indicated, and are an indispensable part of the treatment, the first step is to secure the neuromuscular control which will make the individual posture conscious.

"The patient must be made to realize that only by a considerable expenditure of energy, both mental and physical, can good results be accomplished. This means a constant conscious effort on his part between treatments, until the neural pathways are firmly fixed and good body mechanics becomes automatic."[14]

If then, the body of man, designed to be used in the horizontal position, is actually being used in the erect position, we can see that defects in body mechanics will develop almost of themselves, no particularly harmful circumstances being necessary to produce them.

Preventive medicine is assuming a larger and more important place. Prevention is more easily effected than cure. For this reason, physical therapists and directors of physical education should afford opportunity for efficient training in body mechanics for the normal child. We must remember, however, that each child is an individual problem, since what may be normal for one individual is not necessarily normal for another. But above all, consider the whole patient.

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The Council on Physical Therapy

of the

American Medical Association

Howard A. Carter, Secretary

Successful treatment of the maimed and crippled during the World War and following it brought forcibly to the attention of the profession and public the therapeutic value of physical agents. In a large measure, the rehabilitation of the injured was accomplished by the skillful use of therapeutic exercise, muscle training, and occupational therapy. Following the war, radiation and electrical devices carrying therapeutic claims became associated with physical therapy. Many unfounded claims were made in the advertising matter for these contrivances.

The World War stimulated the application of physical sciences in warfare. The machine, a product of applied science, had been developed to a point never before attained; hence, it was but one step farther to apply it to the treatment of disease. Prejudice of the conservative members of the profession was not unfounded because the medical literature did not contain a great deal of sound evidence. The profession observed that various modes of treatments, scientific and unscientific, efficacious and worthless, ethical and unethical, were literally unloaded into the new and, as yet, generally unaccepted branch of medicine.

Science, that branch of learning, which might be called a systematic method of knowing something—had been taught in medical schools and premedical colleges, and its methods had been employed for years by the Council on Pharmacy and Chemistry, to determine the therapeutic status of drugs. Nevertheless, a relatively unexplored field of therapeutics was awaiting study. The appearance of radiation devices, machines and lamps, all making use of physical forces and claiming therapeutic potency, opened a road for investigation. Hence, countless articles and papers appeared in professional and lay journals expounding the clinical values of the devices. It has been said that man may be grouped in one of two general categories—he is either a poet or a scientist. No attempt is made to defend this assertion but the fact remains that too much poetry has been included in so-called scientific papers, especially in physical therapy articles. Much confusion would have been avoided—and still would be—if articles had contained a simple description of the methods used in the investigation, a table of the data and findings, and a statement of conclusions reached, based directly on facts recorded. Unfortunately many papers have turned out to be essays on armchair philosophy containing a summary of the writer's imaginative efforts, and wishful thinking. Nev-

ertheless, whether the reports of physicians are conclusive or not, if they show the slightest advance in therapeutics, they should be given careful attention.

Following the World War, there emerged a period of expansion in this country—lands were improved, buildings erected, new apparatus and machines were constructed. The war had stimulated activity in research and new found facts were applied to peace time measures. Commerce and trading were more active and money began to be more plentiful: in short, a period of prosperity was at hand. The manufacturers of medical appliances naturally looked for new outlets, and the increasing interest in physical therapy was one avenue of exploitation. Success of one manufacturer immediately brought in others and the members of the profession were besieged with salesmen, advertising matter, and literature soliciting business. As competition became keener, the manufacturers looked for new therapeutic applications for their equipment. Thus unwarranted and unsubstantiated therapeutic claims gradually crept in the advertising matter and descriptive literature, and the salesmen elaborated their sales talks. In this connection, not all of the blame can be laid at the door of the manufacturers, because one need only to look in the medical literature to find reasons for this unhappy condition. In many cases the companies were urged on by physician-inventors to make these claims. Some manufacturers had gone so far as to send physicians of questionable repute throughout the country to hold clinics for the purpose of demonstrating machines. In most cases, however, these clinics took on the aspects of salesroom demonstrations. On the other hand, some of the more ethical manufacturers should be congratulated for refusing on their own volition to manufacture the proposed devices of pseudo-scientists or enthusiasts.

Thus, in 1925, organized medicine looked on the existing confusion—the conservatives were on one side and the manufacturers and enthusiasts were on the other. With such varied opinions it was hard to arrive at acceptable conclusions. At the 1925 meeting of the House of Delegates of the American Medical Association a timely resolution providing for the establishment of the Council on Physical Therapy, was adopted. The members of the Council were appointed by the Trustees during the fall of 1925, and the appointees held their first meeting in January, 1926. The Council has been in active existence for eight years.

At this time (1926) only a few hospitals had adequate physical therapy departments, and just a small number of physicians were employing this form of healing intelligently. The profession as a whole did not know then, or had forgotten, that true physical therapy consisted chiefly of intelligent hand work—that is, heat, massage, and exercise—and that expensive machines and apparatus played a minor part in the practice of physical therapy.

With the above conditions confronting the newly-formed Council, it can be readily understood that the first two or three years of the Council's existence were devoted to self-education of its members; to formulating rules of procedure which could withstand all criticism; and to studying certain physical phenomena used in physical therapy. This preliminary work was necessary before the Council could approve or refute the therapeutic claims made by certain manufacturers. Physical therapy was a new field in therapeutics to the Council members, as well as to most of the members of the profession, and of necessity they had to move slowly and cautiously if the work of the Council was to be permanent.

The Council consists of twelve men—one internist, two physiologists, one pathologist, one physicist, one radiologist, one dermatologist, two orthopedic surgeons, one general surgeon, and two physical therapists. Six of the original members appointed to the Council are still active. Two of the Council members died and four resigned; two were not reelected, and their places were immediately filled by others appointed by the Trustees.

The Council has held from one to two meetings a year, and the Special Committee of the Council, consisting of three members, has met several times each year. More than ninety per cent of the work of the Council is carried on by a Bulletin sent to the members every two weeks.

The present membership is as follows:

Dr. H. E. Mock, Chairman
Dr. W. W. Coblentz
Dr. J. S. Coulter
Dr. A. U. Desjardins
Dr. F. J. Gaenslen
Dr. W. E. Garrey
Dr. Yandell Henderson
Dr. H. T. Karsner
Dr. Frank H. Krusen
Dr. G. M. MacKee
Dr. R. B. Osgood
Dr. Ralph Pemberton
Dr. Olin West (ex officio)
Dr. Morris Fishbein (ex officio)

As to its activities, the Council has prepared and adopted official rules and requirements for submission of apparatus, and minimum standards for acceptance of apparatus, e.g.: (1) regulations to govern the advertising of ultraviolet generators to the public and to the medical profession, (2) acceptance of sunlamps, (3) diathermy; a statement preliminary to the acceptance of diathermy apparatus.

With the cooperation of the American Standards Association, the Council has developed a list of definitions and nomenclature. This is the first complete list of physical therapy nomenclature in which the definitions of the terms correspond with the same terms used by physicists, engineers, and other scientists.

It has made extensive study and investigation of ultra-violet, visible, and infra-red radiation, and corrected many of the abuses of radiation therapy due to the lack of familiarity in the profession concerning this form of treatment, by (1) investigating a great many types of ultra-violet lamps and developing the emission standards for certain groupings of lamps, (2) developing and adopting ultraviolet radiation dosage units in general use in the United States, (3) developing and adopting standards for the control of ultraviolet radiation advertising to the profession and to the public, (4) conducting investigations into x-ray and radium products and therapeutic practices.

The Council has cooperated with the American Standards Association, working with the American Society of Ventilating Engineers in the investigation of air conditioning and health claims in connection therewith.

It has cooperated with the Council on Medical Education of the American Medical Association, the American Orthopedic Association, the American Congress of Physical Therapy, the American Physiotherapy Association, and the American Occupational Therapy Association, in developing standards for the education of technicians. This work is progressing most satisfactorily.

It also has secured the services of leading physicists,

physiologists, clinicians, and others, who have served as consultants and as investigators of apparatus.

The Council has published sixty-two articles, which have dealt chiefly with those physical therapy procedures most applicable to the work of the general physician; which have refuted many false therapeutic claims for certain physical therapy apparatus; and which have otherwise endeavored to place physical therapy on a sound basis. Most of the articles have been included in the Handbook of Physical Therapy, edited by the Council and published by the American Medical Association.

The Council has formally considered two hundred and ninety pieces of apparatus. Of these one hundred and thirty have been accepted, seventeen rejected, and the remaining one hundred forty-three are still under consideration. Of these latter, a large portion have been investigated and rejected, but at the request of the manufacturers the publication of these reports has been postponed while the firms are gathering better evidence. The Council has withdrawn acceptance of one product, and has refused to consider about one hundred mechanical nostrums.

As to the advertising of therapeutic products and methods, the Council has assisted in raising the tone of the advertising matter and has been instrumental in the improvement of merchandising methods by reading, revising, and in many cases completely eliminating approximately five thousand separate pieces of advertising material, and by securing the cooperation of the better manufacturers. In this connection, hundreds of letters have been received from physicians showing their favorable reaction to improved advertising and merchandising methods.

The Council has discouraged "clinics" which were conducted by manufacturers for the demonstration of their apparatus, and has eliminated almost completely the giving of lectures throughout the country by physicians of questionable repute, employed by manufacturers.

The Council has devoted much time to the education of the medical profession in physical therapy, by preparing standards for undergraduate and postgraduate education in physical therapy, by supplying speakers to state or county medical societies, by the Council members presenting papers before many representative medical associations in the United States, and by formulating a method for extending postgraduate education. It has arranged for exhibits in physical therapy in conjunction with the Committee on Scientific Exhibit at the annual session of the American Medical Association, and also at state medical societies and special medical associations.

The framers of the original resolution were farsighted when in determining the scope of the Council's activities, they stated the following " . . . . whose duty it shall be principally to investigate and report on the value and merits of all nonmedicinal apparatus and contrivances offered for sale to physicians and hospitals and to publish in *The Journal of the American Medical Association* from time to time the results of its investigations."

The Council is now enlarging its activities by investigating the "nonmedicinal apparatus and contrivances." Lenses and ophthalmological devices are being investigated and reported on, and the Committee on Standardization of Instruments and Drugs of the Section on Ophthalmology of the American Medical Association is cooperating in this important work. Surgical supports, belts, pads, shoes, etc., are coming up for investigation and report.

From the above summary of past work of the Council, it can be authoritatively stated that physical therapy is now in much better repute with the entire profession than it was at the time the Council was organized. At that time, justifiable skepticism was warranted by the misuse of physical therapy. Today patients are receiving more and more of that type of physical therapy which is of real value to them.

Is Physical Therapy Necessary in Treatment of Fractures?

Donald T. Jones, M. D.*

The routine use of the physical therapist in the follow-up treatment of fractures and the indications for the different measures are firmly established and universally used. It is regarded as an absolute necessity, not only in decreasing the period of disability, but also in attaining a full and complete reestablishment of normal joint function.

Böhler, of Vienna, however, treats hundreds of cases without the use of any physical therapy treatment, except that which the patients carry out themselves depending upon the absolute fixation of the fracture together with the early use of the part.

Due to the fact that the elimination of a physical therapist depends entirely upon the treatment, it is of necessity that some brief mention must be made of the immediate treatment together with a condensed comparison of the end results.

Fracture of Spine: Reduction modified method of Davis rendered para vertebral anesthesia. Spine is immobilized in a hyper extension with the padding only over the bony prominences. The patient is confined to bed for a period of two weeks. At the end of this time, exercises are started. These exercises consist of straight leg raising, stooping and raising with weight on head, and also the lifting and lowering of the body with overhead trapeze. All these exercises are done in an attempt to strengthen the abdominal and the back musculature. The exercises are carried out for a period of three months with the patient immobilized in the cast, and then for three more months when no support is worn. The patient is ready to return to work at the end of the six months. This treatment can be carried

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out without causing compression changes in the bodies due to the fact that the spine is absolutely fixed. This treatment is applicable to those fractures of the lower dorsal and lumbar spine when no paralysis is present, although in these cases, the immediate treatment is the same.

End results are exceptionally good for there is a surprising degree of muscular development, even in the elderly cases due to the absolute fixation, which enables the patient to exercise.

There is also an absence of pain and no restriction of motion due to prolonged immobilization.

Fractures of phalanges and metacarpal bones: Fixation on Böhler finger splint in plaster. Immobilized in flexion and a sufficient degree of lateral deviation to prevent any interference with proper grasping mechanism of hand. Patient has free use of all the fingers.

End results are as follows: full flexion returning rapidly with limitation of full extension persisting for several weeks.

Fractures of carpal bones: A non padded cast is used. The patient is instructed to use hand freely at once. The immediate use of the fingers has apparently no effect in respect to delaying union.

End results are very good and the degree of motion in wrist immediately after removing the cast is usually about 50% even though the patient has had prolonged period of immobilization.

Fractures about the wrist, colles, etc.: Reduction under local anesthesia. A non-padded cast is used. Patient has the free use of the fingers and he is told to use his hand in the ordinary activities after acute sensitiveness has subsided.

End results are good and the degree of motion immediately after removal of cast is 50% of normal.

Fractures of bones of forearm: Use a non-padded cast with or without a two-pin fixation, depending of course upon the type of fracture. Patient has the free use of fingers together with a daily exercise of the shoulder for prevention and restriction of motion.

Fractures about elbow: Immobilized usually at right angle rather than acute flexion. Full supination of forearm to prevent valgus deformity.

End results in adults have quite a prolonged period of convalescence, but children are much better due to the fact that no physical therapy manipulations are used, and no massage which in these cases sets up more irritation, and secondarily, more limitations of motion. The "let alone" treatment of these cases is the ideal method for there is a much more rapid return of function.

Fractures of humerus: These fractures are all treated in position of 90% abduction and neutral position of rotation. Routine exercises as soon as fracture permits.

End results show that apparently routine fixation of these fractures in this position give much more rapid return of abduction of the shoulder joints.

Fractures of femur: Pin traction used in practically all cases. If pin is placed through shaft of femur, an overhead traction to lower leg is used so that some motion is carried out in knee. If necessary pin is placed through tibia, but traction is only maintained in the manner for five weeks. Then it is transferred to femur so as to prevent relaxation of knee. After pin is transferred exercises are carried out as before. The foot is constantly moved. Patient's position in bed is changed by raising and lowering of body so as to prevent limitation of motion in hip.

End results are good but patients complain of painful knee, in a fair percentage of cases.

Fractures of lower leg: Non-padded cast is used. Two pin fixation. Knee only immobilized in the high fractures. Patient can walk in about eight or ten days, depending upon the degree of soft tissue reaction which delays reduction. After removal of plaster, a Unnas paste boot is worn to prevent reactionary swelling.

End results are very good. The free use of leg in walking with the non-padded cast prevents persistent swelling after its removal with an ankle that is practically normal as regards function. The degree of motion in the ankle after prolonged immobilization, is striking.

Fractures about ankle joint: Immobilized in same manner with early resumption of weight-bearing. Emphasis is placed upon proper treatment of simple fractures of the external malleolus in overcoming the slight abduction deformity with lateral subluxation of astragalus with resulting trumatic flat foot if not properly corrected. All cases are immobilized at a right angle.

SUMMARY

Böhler shows definitely that fractures can be successfully treated with physical therapy measures with end results as good and sometimes better than the ordinary methods with the usual follow-up treatment. The degree of motion in the joints after prolonged immobilization shows the value of early functional use of the part as well as the importance of the position of immobilization in optimum degree of function.

The end results are dependent upon the method of immobilization in permitting early functional use. This treatment is not applicable to all cases in this country as we have an entirely different type of patient. The method is radical. Some discomfort is experienced at first which many patients will not tolerate. Böhler end results show the importance and necessity for early functional use in the prevention of prolonged or permanent disability so often lost sight of in the treatment of the fracture case.

Physical Therapy in Fractures

Robert H. Kennedy, M. D.

The treatment of fractures has improved considerably since the war, but in general it is still the most poorly handled field of surgery. The majority of fractures are, and probably always will be, treated by the general practitioner. Their great difficulty is in appreciating which ones they can properly attend and which need to be cared for by someone with special experience. Irretrievable damage in some cases is done by lack of expert care in the first few days. The toll of permanent disability following fracture is far too great, and will be diminished only by constant effort to educate the entire medical profession. No method of treatment can return to normal an improperly reduced fracture.

In order to know what assistance the fracture surgeon may expect from physical therapy, it is necessary briefly to review the pathology of fracture. When a bone is broken, blood and tissue juices pour out from the fractured ends and from the adjacent injured tissues. Clotting takes place almost immediately and repair commences. New connective tissue cells appear and start to grow into the clot from each end of bone to be replaced later by the deposit of bone salts, producing first callus and later bone. Even when solid union has occurred, change still goes on in the arrangement of the bone cells to take up stress and strain and to assume the character of normal bone structure. While the process of new bone formation to replace blood clot goes on, waste products must be removed. Many cells are killed or severely injured at the time of fracture and the circulation must remove this debris. Local calcium is set loose from the damaged cells and it must play its part in the formation of new bone or be absorbed into the blood stream. Nature always overdoes a repair job and many cells and much fluid are brought to the part which are of no use. They must be dissipated.

This is the simple situation with an immediate successful reduction followed by effective immobilization. More commonly the injured part is immobilized in an indifferent fashion. While the patient is being moved to the place of treatment the fractured ends can churn about within the muscle and do further damage. Blood clot which has formed immediately is broken up and fresh extravasation occurs. Too often reduction is delayed for hours or days and connective tissue which has commenced to form is then broken up. Nature has to begin the repair process over again. One still finds men who believe a fracture should not be reduced until the swelling has gone down. The quickest method of reducing the swelling is to reduce the fracture. Insufficient immobilization after reduction hinders nature's repair work, since the slightest movement at the fracture site will tear or displace newly formed connective tissue cells.

In immobilizing a fracture, a future function must be given as much consideration as present anatomical position of fragments. Where muscle pull in one direction is more powerful than in another, generally the stronger, not the weaker, muscles should be put on a stretch, that is, splints should not be applied allowing foot-drop. It will take much longer to return to normal a shortened tendo-achillis than shortened muscles on the anterior surface of the ankle. The duration of immobilization can be longer in a shaft fracture than in one involving a joint, first, because union takes longer in the former and second, because the greater the distance from a joint the less probability there is of stiffness following fracture. At present I believe that physical therapy is used more to correct the results of bad surgery —indifferent reduction, improper or insufficient immobilization, fibrous replacement of edema—than for prophylaxis or early treatment, where it is chiefly of service.

On the basis of the pathology of injury and the physiology of repair, what assistance does the surgeon anticipate from physical therapy?

1. To hasten the laying down of new tissue. The processes of repair outlined above proceed through the local blood and lymph supply, brought about by the general circulatory system. Part of this supply has been damaged by the injury. The remainder must be assisted to carry an extra burden.

2. To carry away waste matter. An injury means that some cells are destroyed. Dead tissue must be carried away. Increased demand on the circulation is made to accomplish this.

3. To increase local heat. There is reason to believe that within certain limits increased heat aids the processes of repair in ways other than mere dilatation of vessels, possibly by some effect on the temperature of the chemical process.

4. To prevent stagnation in the parts. Edema, if present, must be removed as rapidly as possible.

5. To relieve pain. Often more is accomplished by physical treatment than by sedatives.

6. To maintain muscle function. Not only is this worth while for its own sake, but also active use of muscle is one of the chief means of obtaining adequate blood supply to an extremity.

7. To maintain joint function. If early motion at the joints on either side of a fracture can be obtained without endangering the proper healing of a fracture, the length of disability is diminished.

8. To maintain the patient's morale—to have the patient feel that something is being done for him and to secure his cooperation in the doing of it.

The surgeon must accept entire responsibility for treatment of a fracture under his care. He must decide on the necessity for and time of reduction, the type of immobilization, the correctness of the reduction (he should not accept the report of the roentgenologist without personally seeing the x-ray films), the time at which motion of joints shall be started, the time of removal of splints, the time for weight-bearing. The physical therapist should not take the initiative in any of these matters and he should not allow the surgeon to throw any of these responsibilities upon him. At the same time the surgeon should welcome suggestions from the physical therapist as to modalities which the latter thinks might be of value in an individual patient. But the physical therapist should insist that the surgeon give the order for their use. By placing the entire responsibility on one person there can be no question about the legal and moral obligation.

We should consider how a surgeon views the value

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of the various modalities of physical therapy to attain the eight aims mentioned above.

1. *Position of the injured part.* In one of the most recent books on physical therapy there is no mention of this in the section on fractures. Elevation of a fractured extremity after injury and until all swelling has disappeared, is of more importance than heat or massage. Gravity will do much to prevent and relieve edema. A patient lying in bed with an injured lower extremity does not need a pillow under the leg, but some arrangement by which the site of injury is kept at a level above the heart. A fractured wrist should not rest in a sling all day, but a considerable time should be spent standing with the elbow resting on a mantel piece or sitting with the arm on the back of a chair. This assists venous and lymph return flow and relieves stagnation.

2. *Heat.* In superficial injuries cold should be used for the first twenty-four hours to prevent further extravasation. In the majority of fractures I think this is a theoretical consideration only, so that heat should be applied as soon as possible. With reduction, immobilization, and elevation, increased extravasation is usually not evident. Frequently the application of heat consists in the use of a thermolite ten to fifteen minutes, once or twice a day. In this way it is merely an aid to massage. The part should be kept somewhat above body temperature through the whole twenty-four hours by means of a thermolite at a proper distance, a covered cradle with electric lights beneath, or some similar means. Infrared is a good form of heat, but again is used only as a form of, or an aid to massage, if it is employed once or twice a day. Heat improves the circulation, relaxes the muscles, and carries away extravasation and detritus.

Absurd treatment has a good example in a case I came across recently. For several weeks heat had been applied daily to a circular plaster casing and the doctor expected to be paid for it. Evidently the medical profession needs considerable instruction in physical therapy before being capable of utilizing its various methods and agencies.

3. *Massage.* Massage should be used early, when there is pain, and edema and extravasation of blood are present. Late, it is probably of little value, if early treatment has been carried out properly. Superficial sedative massage is the only type which should be used. Any form of massage which causes pain or apprehension on the part of the patient, is contraindicated in acute injury. Superficial massage is excellent before reduction, as long as its use does not delay the time of reduction. After reduction it should be started on the day of injury, if the part is exposed. If in a cast, massage should be commenced as soon as it can be safely removed. One great advantage of molded plaster splints, over circular plaster bandages, is that they are removable for treatment by heat and massage. Treatment in traction-suspension also allows complete exposure of the part. If possible, superficial massage should be employed more than once a day. It is sedative, increases circulation, and dissipates waste products and edema. Deep massage should not be used until solid union is present, as blood clots may be loosened, embolism started, healing interfered with, and the fragments displaced.

4. *Muscle stimulation.* This may be obtained by various types of the faradic current. If steady and minimal stimulation is used, it preserves muscle tone and improves the circulation. It can be used to some extent with a part in a cast. I was impressed by the possibilities of the Morton-Smart machine as demonstrated at Dr. Sherman's clinic in Pittsburgh, although I have had no personal experience with it. Originally it was too expensive for general adoption, but I understand simpler forms are now available at much less cost. Such treatment should be in the hands of well trained persons. It must be absolutely painless and non-spasmodic.

5. *Active motion.* If active motion of the joints involved in the fracture, or either side of the fracture, can be carried out without disturbing the position of the fragments, it is the most important physical method of treatment. Union is the first consideration, but return of function is a close second. By active motion I mean that which is accomplished entirely by the muscular efforts of the patient's own injured extremity. It should not cause pain. Pain is the natural warning that continuation of such movement may produce damage. When so instructed, the patient can usually be trusted to use no range of motion beyond that where pain commences. The patient does not resist physical motion which he makes himself. Let someone else lay a hand on the part and his protective mechanism immediately becomes evident with resistance of all the regional muscles. Motion now becomes neither active nor passive, but resistive. It is an exceptional person who can relax completely for passive motion, and even such a person can almost never do so in the presence of acute injury. Although the technician does not touch the part, his function in guiding active motion is all important. Treatment by open operation with internal fixation often allows earlier active motion. Many forms of skin or skeletal traction permit immediate active motion without danger. Treatment is cases with molded plaster splints in some locations makes possible early active motion by the removal of the bandage, or of one of the two splints while manually controlling the fracture site. This treatment should be given solely by the surgeon who reduced the fracture. Many Colles' fractures without much comminution can be treated by the third or fourth day.

In general there is no excuse for immobilizing any joints except those on either side of the fracture. Yet it is common to see splints applied to the finger tips for a Colles' fracture. They should never extend distally beyond a line where complete function at the metacarpophalangeal joints is possible. Frequent active motion of all the fingers and the individual joints should be insisted on. This means contraction of the major portion of the muscular bulk of the forearm, which increases the circulation of the forearm and through it the site of the fracture. It also helps to dissipate edema in the fingers, prevents the later fibrosis about finger joints, and preserves the precision movements.

With a hand, wrist or forearm fracture, the patient should not be allowed to keep the arm quietly in a sling. He should be trained to exercise the shoulder in all directions several times a day with particular emphasis on abduction and external and internal rotation. I have seen disability at the shoulder joint, when we felt certain that there had been no original injury there, last longer after a Colles' fracture than the disability at the wrist joint.

In bed, patients with fractures of the lower extremities it is important to give instruction in exercises for the three uninjured extremities and the back. This helps the general circulation and the patient's morale. Also when he is allowed up his entire weight will be borne on one leg and on his arms through crutches. His progress will be more rapid if these muscles have previously been given attention. For the same reasons in fractures of the spine, active exercise of all four extremities should be practiced.

XUM

Active motion so far as possible should be commenced on the day of injury. Each day that joints are held immobile is apt to increase the time before return to normal function. There is nothing that serves so effectively to dissipate edema as guided motion. In addition to the physical improvement brought about by obtaining the patient's co-operation in active motion, the psychic effect plays a real part in promoting early function. Many patients, once having been trained, show a great interest in demonstrating throughout the day how much they can do for themselves.

6. *Passive motion.* Passive motion has no place in fracture treatment, at least until solid union has taken place. As stated above, passive motion on such a patient is really resistive motion. I do not care how perfectly trained or adept a masseur may be, he should not be given nor should be accept the responsibility of moving the joints either side of a fracture until union is absolutely solid. This holds true whether the surgeon administers his own treatment or turns it over to a physical therapist or technician. Fragments may be moved, processes or repair may be interfered with, pain may be caused, and muscles may be overstretched causing spasm. It is preferable that the joints adjacent to a fracture should never be moved until the bone is solid, than to have any passive motion employed. In addition to consideration of the welfare of the patient, one must also appreciate the frequency of malpractice suits in fracture cases and not lay one's self open to the possibility of increasing the damage done by the original trauma, and thereby incur legal liability.

After union has taken place, passive motion should not be necessary, if proper treatment has been given during the earlier stage. Unfortunately, under present day treatment it is needed all too often to break up adhesions due to the fact that edema has not been dissipated early, to stretch muscles which have been allowed to contract in poor balance, and to mobilize joints which have become fixed by lack of use or by edema. But remember that you are not treating the results of injury but the unfortunate results of treatment or lack of treatment. Here again cooperation of the patient is most important. Firmness with gentleness is necessary. Forced stretching does more harm than good, both physically and mentally. Muscles and ligaments are sometimes torn by forced stretching, accompanied by prolonged pain, spasm of muscles and even ecchymoses. If a patient comes for treatment with a feeling of fear, something has been wrong with previous treatment.

7. *Diathermy.* Diathermy is used in fractures to increase heat in the deep parts. By increasing the circulation it is expected that waste products would be carried away more rapidly and more bone salts brought to the part. As a matter of fact, we have no evidence that the amount of calcium or phosphorus in the diet or the blood has the slightest effect on the rate of healing of a fracture. Probably the bone salts used in repair are obtained locally from the bone which degenerates at each end of the fracture as a result of injury. To increase the local deep heat is just as liable to mean that bone salts are carried away more rapidly from the site of injury as that more calcium and phosphorus are deposited there. I watched the effect of diathermy for a period of about two years. In some cases I thought healing was hastened. In others, although the x-ray showed callus formation progressing normally before diathermy was commenced, I saw in the x-ray definite absorption of callus and clinical union become less firm while diathermy was being used. I believe it is impossible to forecast what effect it will have on an individual patient, and, I have therefore discarded its use for the past eight years.

8. *Hydrotherapy.* Many forms of hydrotherapy are useful in the late treatment of injury. Hot baths, the Scotch douche, and particularly the whirlpool bath are valuable in late edema, and to restore muscle, tendon, and joint function.

9. *Exercise.* Reeducation of muscles and joints by means of gymnastic apparatus and occupational therapy is valuable in late treatment. Wherever obtainable the latter is much more important since the exercise becomes automatic and rhythmical. The possibilities in this field are not sufficiently appreciated. Such therapy can never be standardized, but requires ingenuity on the part of the operator and personal interest and instruction in individual cases.

So much for what a surgeon thinks of different physical methods. A warning must be given about prolonged treatment by physical therapy, particularly in patients coming under the compensation laws. Each treatment makes the patient feel better. As long as he is under treatment he does not have to return to work. In our interest in improving his local condition we are likely to fail to see that the gravity of his injury is increasing in his own mind. Many patients when told that they are ready for discharge will insist on further treatment. A neurosis has developed under our eyes which may take longer to cure than the original injury.

The physical therapist should insist that all patients be seen by the surgeon at least once a week for discussion of the progress, change in indication, and time when the maximum improvement has been reached. Nothing is more inimical to the progress of physical therapy than to have patients remain under treatment for too long a period. A man who has broken his leg and recovered to the point where he walks on it a mile a day, does not need to come to a clinic for heat and massage. Often a man is receiving treatment by physical methods when what he really needs is a neurologist. We should remember that these methods do not cure a person, but help him to cure himself.

Physical therapy has no place in the treatment of fractures in children. It is unnecessary, because the function of muscles and joints will return completely and promptly by the child's own active motion when all splints have been removed. Moreover, it is inadvisable because rarely can the child's cooperation be obtained. Without cooperation such treatment had better not be given.

CONCLUSION

Physical therapy can be an important adjunct in the treatment of fractures. No after treatment can make up for late or poor reduction, ineffective immobilization, or improper initial teatment. The physical therapist should not take the responsibility at any time during treatment for the care of a fracture. All changes in treatment should be on the authority of the man who originally took care of the patient. When the limit of improvement by physical methods has been reached, the surgeon should be so informed and further treatment refused. The patient must be made to feel that these methods assist him to cure himself. The most propitious time for physical therapy is in the first ten days. After this it becoines progressively of less value. There is much to be learned about the action of many forms of physical therapy, and we need close cooperation between physical therapists and surgeons to insure the best therapeutic effects in fractures.

XUM

The Use of High Frequency Currents in Gynecology

Margaret H. Sutley, M. D.*

The development in the field of physical therapy in the past few years has brought certain modalities to the attention of the medical profession, so that it presages a closer affiliation between the physical therapist and the physician. It requires that the standards for trained therapist be raised and that the physician give more thought and study to physical measures.

Certain specialized fields in medicine such as orthopedics, neurology, and dermatology, for example, are constantly using and developing technique along physical lines.

The internists and surgeons are a little more slow in adopting those phases of physical medicine which are valuable. In the field of gynecology, the old standards of treatments have been so firmly fixed, that it has remained in the hands of a few, who have the courage of their convictions, to push forward the information and therapeutic possibilities of high frequence electricity.

One of the most frequent complaints in gynecological cases is leukorrhea. The subsequent examination often reveals a chronic cervical infection which may have had the gonococcus as the original invading organism or a mixed secondary infection from trauma such as occurs in parturition instrumentation or criminal abortions.

There is an increasing recognition of these two facts: that the cervix is a focus of infection, and that a diseased and neglected cervix increases the danger of cancer. Furthermore, cancer is more common in the woman who has borne children and whose cervix has been subjected to birth trauma.

It is necessary that obstetricians continue their observations of their patients well beyond the immediate delivery and be prepared to repair injuries at the time of delivery or subsequently, so that few women will be permitted to go about with lacerated, infected cervices.

It has been the practice for years to try many germicidal agents, the more prominent of which are various silver preparations, and to use tampons and packs for depleting the congested organ.

Cervical operations have been devised and used, chemical and electrical cauterization has been done, but to the physician familiar with the high frequency current many of these older methods of treatment can be replaced by electro-coagulation or conization following the technique of Hyams.

Before enlarging upon these electro-surgical measures, medical diathermy might be discussed. The theory behind the use of this treatment is that heat is generated in the tissues, creating an active hyperemia with a leukocytosis and increase in lymphatic flow which augments nature in her own method of repair. Heat also has a deleterious effect upon the gonococcus and creates unfavorable environment for its growth.

Electrodes designed for urethral, cervical and vaginal treatments are available; the dispersing electrode is preferably a belt about the waist. No medical diathermy should be given any gynecological patient without preliminary vaginal and bimanual examinations by a person familiar with pelvic diagnoses.

Pregnancy, tumors, bleeding and acute pelvic masses are all contra-indications for the use of this treatment.

A few chronic pelvic cases will respond favorably, but aside from relieving pain and aiding resolution, it is not likely that medical diathermy will cure pelvic inflammatory conditions.

On the other hand, if the infection is in the cervix and it is engorged and edematous, the depletion following medical diathemy is excellent. Cervical drainage is improved, leukorrheal discharge lessened, and the response is gratifying to both the patient and the doctor. To cure specific infection other portals of entry, such as Skeene's and Bartholin glands need simultaneous treatment.

Cervical strictures and stenosis can sometimes be overcome by a cervical electrode in the canal, but likewise can be caused by too much heat or careless technique.

Post operative cases with induration in the uterosacral ligaments or low grade cellulitis are greatly helped by medical diathermy.

The average physician gets discouraged in the use of medical diathermy because of the time required to treat the patient and the constant attention to the details of the technique. It is here a nurse technician or physical therapist working with the doctor is very helpful. Cases should not be sent out to the physical therapist for these treatments because a cervicitis this week may cause an acute pelvic abscess the next.

Surgical diathermy is very valuable and an adjunct in office procedures. As mentioned before, electrocoagulation or conization is a method of dealing with cervical infections which replaces some operations and should replace the actual cautery. Cauterization of a cervix is unnecessarily traumatic and the excessive heat produces a severe inflammatory reaction with subsequent firm scar tissue. This scar tissue can cause stenosis of the cervix or at future pregnancies, dystocia. Coagulation or conization removes all of the diseased glands, the reaction is not so severe, the final scar is more plastic and this procedure with the proper technique, rarely needs to be repeated. A machine which has a good steady current and with which the physician is familiar is quite important. An aluminum needle for the active electrode is most satisfactory, permitting coagulation in any type of cervix, particularly in those which have stellate lacerations and old scar tissue. Conization is most valuable in a cervix not previously torn. The technique used in coagulation requires no anaesthesia except locally and the time of contact with the tissues should not exceed five seconds at each area coagulated. Overlapping zones of coagulation are best, extending from the external to the internal os in parallel lines so that the subsequent slough is like a pyramidal cone, the wider part at the external os.

After the cervical canal is coagulated, Nabothian cysts can be destroyed in the same way and erosions cleaned up completely by unipolar dessication. An ero-

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sion is a result of cervical infection and must not be treated *per se;* the racemose glands which harbor infection require destruction.

The cutting current is useful for minor operations such as clitoridectomy, removal of hypertrophies, Bartholin glands and cysts, venereal warts, polyps, hemorrhoids and biopsies. It gives the surgeon an opportunity to do these operations without bleeding and no sutures are required. Secondary infection is less likely because the process is self sterilizing and the final scar tissue is extremely elastic as compared with scalpel surgery.

Other forms of physical therapy are helpful to the gynecologist, such as baths, massage and light treatments. Some cases of gonorrhoeal arthritis, sacro-iliac strain and poor body alignment will complicate gynecological cases and when this occurs the physical therapist is needed very much.

Radium and X-ray are classed as physical agents. The field for this specialty is ever growing. Diagnostic X-rays and roentgen treatments are well known and accepted. Radium is one of our best aids in cancer, but going back to the high frequency current, the early and intelligent use of this modality will probably prevent the need for radium at a later stage.

Recurrent Dislocation of the Shoulder Joint

John A. Brooke, M. D.*

Recurrent dislocation of the shoulder joint is a rather common disability and in most instances follows traumatic dislocation. The predisposing cause of this instability of the shoulder joint is usually laxity of capsule and weakness of the supporting muscles. Many times the result of too early use of the arm after the accident.

A dislocation of the shoulder joint is often treated very lightly. It may be pulled into place by a fellow workman, a playmate, a friend, or a foot-ball coach, and perhaps not even supported by a sling; the injured continuing to use his arm and giving the torn or stretched capsule no chance to completely heal or the injured muscles to regain their tone.

A dislocated shoulder should be immobilized for at least three weeks and this followed by massage and graded exercises to bring back the tone of the muscles before the shoulder is put into real active use.

In certain cases congenital defects in the glenoid and head of the humerus may be a predisposing factor. Fractures of the margin of the articular surface with torn muscles also contribute to the instability.

Stevens has nicely described the full abduction of the normal arm from the side of the body, in pronation to the side of the head; an arc of one hundred eighty degrees. First the supraspinatus starts the motion, then the deltoid goes into action and continues the abduction to ninety degrees and from this point the inferior angle of the scapula can be seen to swing outward as the acromion is pushed upward by the greater tuberosity or lifted upward by the action of the trapezius and serratus. At about one hundred thirty degrees the scapula ceases to move outward to any extent and the greater tuberosity is felt to slip under the acromion and abduction continues to one hundred eighty. The trapezius has simply raised the acromion to give more room for the rotation of the head, its further action is synchronous with the other muscles of the scapula and shoulder in holding the humeral head firmly in the glenoid. The humerus is held down in position and kept from locking under the acromion by the short rotators, the infraspinatus and teres minor behind and the subscapularis in front. The pectoralis major is an adductor but when the arm has swung upward to one hundred thirty degrees it becomes a powerful abductor in completing the final arc of the one hundred eighty degrees.

As to treatment of habitual dislocation of the shoulder joint; if the recurrences have been at long intervals and only a few times, there may be just laxity of the capsule and some muscular weakness. Conservative treatment may be tried of a period of fixation and massage and exercise of weak muscles. As most of these dislocations occur reaching for an object above the head or when the arm is forcibly thrown upward, these movements should be restricted. A simple device that is in general use is the shoulder cap of canvas held in place by straps across the body and buckled beneath the opposite arm.

When the simple measures are ineffective and redislocations occur, operative measures are advisable. The most frequent surgical repair for this condition has been that of suture of the capsule, reducing its size by incision and overlapping this, held by mattress sutures.

T. Turner Thomas, of Philadelphia, who has given much study to dislocations of the shoulder joint, makes his incision posterior to the axillary vessels and repairs the thin part of the capsule by removing a section and applying sutures in the usual way. Allis, many years ago, called attention to the action of the pectoralis major as a cause of this dislocation and divided the tendon with apparently good results in certain cases. Sever also believes that the pectoralis major plays a part in these redislocations and advised section of pectoralis tendon and shortening of the subscapularis tendon in addition to the capsulorrhaphy. Bennett, and others, quilt the capsule with strips of fascia lata to give added strength. Girgolaff drills a hole in the humerus and passes through this a large band of fascia lata, crosses it, and attaches one end to the coracoid and the other to the acromion.

In cases in which there is extreme laxity and relaxation of the structures, the Clairmont operation has been advised. This consists of separating the posterior one-quarter of the deltoid from its insertion, separating the fibers upward and swinging it under the humerus and attaching it to the anterior border of the deltoid, near the coracoid, forming a sling beneath the head which becomes tense when the arm is abducted.

In the last five years the only operation that we have done for recurrent dislocation of the shoulder is the Nicola. It is the simplest and most effective that we have tried. The long head of the biceps is used as a ligament to prevent the head of the humerus from slid-

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ing down over the inferior margin of the glenoid. The technic is as follows:

1. An incision from above the coracoid downward on the border of the deltoid muscle.

2. The upper and anterior fibers of the deltoid are divided close to the clavicle; the dissection is then carried downward.

3. The pectoralis major and cephalic vein are retracted inward, the deltoid outward.

4. The tendon of the biceps is exposed up to its insertion. The transverse humeral ligament which holds the tendon in the bicepital groove is divided and the capsule opened in the line of the fibers of the ligament.

5. The tendon of long head of the biceps is now divided above one inch below the cut margin of the transverse ligament. Black silk ligatures are placed in both ends of the cut tendon to have them under control. The elbow is now flexed to about forty-five degrees relieving any pull on the tendon.

6. A hole is drilled through the head of the humerus in the line of the bicepital groove starting just below the transverse humeral ligament coming out near the center of the articular surface of the head. A one-quarter inch drill is used. A probe or threader is passed through the hole and the tendon pulled through the tunnel and attached to the distal part with silk. Tension is made on the proximal part and sutures placed through the tendon and periosteum near the bicepital groove, so as to fix the tendon and remove tension on newly sutured area. The capsule and ligament are sutured and the wound closed and shoulder put up in a simple Velpeau bandage, elbow flexed to forty-five. This is kept in position for three weeks.

We have operated nine cases in our department by this method and there have been no recurrences, or any definite limitation of motion following.

In a letter from Doctor Nicola just a few days ago, he states, that he has lately only immobilized his cases two weeks, except the epileptics, which have been held for six to eight weeks.

Mental Hygiene for the Handicapped Child

R. A. Jefferson, M.A., M.D.

It has become a habit of mine in thinking of physical handicaps—whether in adult or child—to classify them primarily into two types; namely, those which are visible or audible to the average person, and those which are not. In my judgment this division is of major psychological significance to the mental hygienist. The problems one sees seem to vary accordingly and it is my purpose herein to clarify some of these.

Let us consider first the child with a visible handicap. There are many forces at work which tend to focus the attention of the child upon the handicapped part. Many of these are absolutely unavoidable; for instance medical therapy, corrective exercise, etc. A certain part or function of the body is receiving more than its ordinary share of attention. It has become on one hand a means to a social end inasmuch as all of us, one way or another, basically need the attention or interest of other persons. In order to claim this favor we use up energy directed objectively through certain channels as in conversation or the bodily activity of sports or the more egocentric activity of self-adornment. We put our best foot forward and trade as social beings upon our strong points. There is no doubt but what the handicapped child may come to regard his defect as one of his sources of strength as well as of weakness—particularly if we neglect the task of building up within him other resources or paths of energy disposal which gain for him social approval. It is generally agreed that handicaps in the physical sphere induce compensatory striving in the intellectual and artistic pursuits, the handcrafts, etc. Excellence in some one of these gives the child greater security in heightened self-esteem and opens a wide variety of possibilities for economic independence. It is a strange but truthful conception that gross handicaps of a physical nature frequently provide the basis or incentive or inspiration for the production of greatness and even genius in the highest types of human endeavor. Thus it is a recognized principle of mental hygiene that child care and training is not the business of eliminating hurdles from the race but rather the occupation of gaging the hurdles so that they will not be insurmountable; of shaving off a little here and there perhaps but never completely removing them. The business of mental hygiene in the task of aiding the handicapped is essentially the business of finding ways and means of gaging the hurdles.

The child's feeling for himself is a thing borrowed for the most part from the attitudes of others toward him. If the members of his family can accept him happily he has less difficulty in adjustment. I am thinking now of the unfortunate facts of adverse parental attitudes toward these physically handicapped children. I can recall a mother who could not accept her child with a congenital hip. Her difficulty sprang from the fact that prior to their marriage her husband had suffered a "leg disease" and in her mind this was wrongly associated with the birth of the mal-formed child. She blamed her husband for the production of her child's deformity. Behind this illogical conclusion (inasmuch as her husband had suffered an acute osteomyelitis and not a deformity) lay the fact that she had never been compatible with her husband; indeed she had sought emotional outlets elsewhere and had entered into affairs with other men. She felt very guilty over these, however, and her guilt was expressed in irritation with the whole life situation. The child bore a large share of the brunt of this. The child stood in the way; it represented the unwanted husband and seemed somehow to epitomize the problems of her life. What chance under such circumstances was there for anything but the most uphappy result for the child. In this case it was necessary to remove the child from the home and place it under happier circumstances. This procedure, however, is at best a doubtful one. Foster homes can not be expected to fully meet the demands of the child and certainly can not quite compete with the healthy environment of the average natural home. Thus one of the primary concerns of the mental hygienist must be the parental attitudes toward the handicapped child.

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If things are well in this phase of the child's life it is a good omen for his future adjustment. Others may shun him, playmates and friends turn away, but the sustaining influence of parental love and his acceptance within the family will mitigate the pain of many a bitter disappointment.

Having stressed the positive values of parental love we must take this occasion to sound a note of warning on the negative side. Love is protective. It is easy to allow it to become so much so that the child becomes far too dependent. After all—handicapped or not—most children must learn to stand on their own feet, must transfer in part their affections to persons outside the family circle lest they remain forever childish. Parents can do much to help the child in his emancipation. In the first place they themselves must have interests which help them to disperse their energy streams and to prevent their emotional life from centering too much about the unfortunate one. Then too they can plan to provide for the child satisfactory relations with persons and groups outside the family circle. Friendships can be arranged and encouraged. The child can be guided to identify himself with groups outside the family which perhaps come together because of some mutual interest. Music, art, science, games; there are, indeed, so many resources in this varied world that the opportunity for such experience is practically open to all.

Intelligent care for the child builds solidly the basis upon which the greater problems of adolescence and adulthood find solution. So many handicaps become greater as the years go on in that they add greatly to the ordinary problems of living. How does it happen that the outcome is ever a happy one? We think of John Doe who has weathered the gale in spite of his withered limb or distorted posture. We say that John has developed a sustaining philosophy. We think of this as an act of adulthood, of intelligence, without which John Doe could not be the person he is today. So it is—an act of intelligence—but only in part. So also is it an act which bespeaks a well integrated personality whose emotional life is sufficiently stabilized to allow intellect and effect to come together in the summation of achievement, which is wisdom. The intellect was there perhaps from the beginning. To be sure it was educated or trained somewhat. How about the emotions? Yes, they were there too but unorganized, primitive, acquisitive, asocial. Only by experience and by healthy action and interaction were they modulated and integrated into some semblance of stability. We are just beginning to learn something about the intelligent discipline of an effective life. Heretofore, it has been hit or miss, the merest chance. John had a temper—born with it just like his Uncle Joe, said Aunt Susie. Skeletons of distorted fancy and emotional unrest rattled in every family closet. Critical examination in the daylight of advancing science reveals nothing there—that is, nothing in the closet—but written indelibly in the life history of the individual are the experiences upon which his peculiarities are founded, upon which his capacities and incapacities have risen.

Much of mental illness and of gross maladjustment to life arises not as a bolt out of the blue but as the sum of a long series of failures in finding satisfactions for fundamental needs; one episode after another of trial and failure, of striving and frustration.

If this be true it would seem clear that the way to build solidly is to provide a series of successes which outweigh the inevitable but occasional failures. This principle applies in the little as well as the big things, in striving to regain lost function for a finger or arm, in trying to re-learn to walk, in trying to make friendly contacts or in striving for the approval of those for and among whom you do your work.

One school of psychiatry—the so-called Adlerian group, would like to find as the root cause of all mental illness, a deep organic inferiority. While it is true that such a situation may indeed bear a causal relationship to neurosis or psychosis or to delinquency, it would seem far too exclusive a doctrine. I am not bringing this matter up for the sake of airing a controversial subject, but rather to introduce the exposition of some of the problems of the handicapped in my second group, namely, those in whom the defect is neither visible nor audible, and yet perhaps of greater magnitude as far as biological fitness is concerned. The world does not ask of the visibly deformed that they compete at the same level. Allowances are made. The world even shows a willingness to aid if not support. But what of the defects we can not see and appreciate? They are unfortunately present in multitudes of persons. If there is shame within the child because of a glaring defect in body structure it is something which he is forced to meet and overcome since there can be no secrecy about it. The same does not hold true for the invisible weakness—the cardiac, the pulmonary, the glandular case. Whereas the visibility of the one type defies secrecy and promotes a compensatory psycho-biological striving while the world makes allowances, the hiddenness of the latter, with the secrecy and shame which so frequently accompanies, makes of social adaptation a doubly difficult task. In such situations it is small wonder that neurotic types of behavior develop. Some children under conditions of this sort find it necessary to remove the curtain from their disability. Everyone must know and make allowances. They come to expect a great deal and give little in return. They become chronic complainers—typical neurasthenics. Other children react somewhat differently. They become shy and secretive and many of them develop, in addition, true paranoidal reactions; that is, they suffer constantly from hurt feelings and ideas of persecution at the hands of other persons and the world at large. The inevitable results of such a trend are the building up of vast reservoirs of resentment and hatred. These children become sadistic and work out their adverse feelings in acts of cruelty against animal pets or against smaller children. They not infrequently develop deep-seated obsessional trends which serve to disperse their pent-up feelings in terms of symbolic activity. Thus a child may develop a morbid fear that an accident may befall his little brother or sister and later come to feel that unless he engages in some form of ritualistic behavior, this will actually come to pass. In this manner he discharges his hatred of an unwanted rival whose physical prowess may soon surpass his own.

To me it seems clear that the pathway of healthy adaptation lies somewhere between these two extremes—between the neurasthenic on the one hand, and the paranoid or obsessive on the other. The child must be made to feel that he has sympathetic understanding without giving him the opportunity to trade too much upon it. Secrecy breeds the shame of stigma and the fear and distrust which warps the child's spirit. If only the child can have contact with adults whose attitudes are healthy and therefore health giving, his battle is three-fourths won.

In closing let me remind you again of that great novel in the English by Somerset Maugham entitled "Of Human Bondage." It is the life story of a club-footed boy and is an encyclopedic exposition of how not to handle a handicapped child.

Psychotherapy in Physical Medicine

Hymen Robert Blank*

Until recently the value of physical therapy was by many medical men attributed chiefly to its psychotherapeutic virtues. Even today, in spite of objective evidence demonstrating the need for physical applications in most organic disease processes in order to augment and facilitate the action of surgical and medical measures, we still hear evaluations of physical therapeutic agents solely in terms of their psychotherapeutic effects. The impression one gets from many of these uncritical opinions is that mental treatment is of little importance in medical practice. The medieval conception still exists that psychological symptoms and therapy are matters more of philosophical speculation than of medical significance.

Experimental psychology and psychiatry have, however, placed psychotherapy on a scientific basis. There is no sharp distinction between the "mental" and the "physical." Mental activity depends on neuronic structures and is thereby in close functional relation to digestive, secretory, circulatory, and other organic processes. Mental disturbances can effect marked physical changes just as organic disease produces characteristic psychic phenomena. Crile, for example, in a recent exhaustive study, has demonstrated an important psychogenic factor in the etiology of such apparently apsychic diseases as cholecystitis and peptic ulcer.[1] Even the casual reader is aware of the emaciation and extreme irritability—certainly extensive organic effects—which frequently result from prolonged worrying.

Assuming that an extra-organic cause can lead to an organic disturbance, it follows that removal or preclusion of the cause—the aim of psychotherapy—will abate or preclude the physical symptoms. The three-fold purpose of this paper is: first, to discuss the psychological mechanisms basic to psychotherapy in general; secondly, to discuss the psychology of the functional nervous disorders as well as the psychotherapy indicated in this type of condition; thirdly, to outline the role of the physical therapy technician as psychotherapist with particular attention to those aspects of physical medicine where psychological treatment is just as important if not more than the specific therapy being applied.

The Psychological Basis of Psychotherapy

Man is an emotional creature, in spite of his deluded opinions of himself. That is, he accepts or rejects a person, thing, or treatment principally on emotional grounds. Then he usually devises reasons for his choice; he seeks objective justification for his decisions after making them. Of course individual differences are apparent; the more intelligent usually depending less on emotional factors in their general behavior. But as far as most behavior is concerned, emotional factors determine the ends we seek, and reason determines the means of obtaining these ends and provides specious explanations for our behavior.[2]

By an emotional reaction to a person, thing, or treatment is meant either an overt or implicit general approach to, or an overt or implicit withdrawal from that person, thing, or treatment. These reactions are commonly known as "likes and dislikes."

In approach reactions, that is, in pleasant states, the parasympathetic divisions of the autonomic nervous system which are concerned with the digestive and sex functions, are operative; in the withdrawal reactions or unpleasant states, the sympathetic divisions, which are concerned with inhibition of digestive and sex functions, dominate the individual's behavior. Emotions, then, are to be identified with visceral states. That is, pleasant states, for example, represent a well functioning digestive system. We are all at peace with the world after partaking of a good meal. This organic condition can be manifested overtly by speech and action, and, as is more usual, chiefly implictly, that is, by thought. The whole pattern, that is, the visceral, somatic, and implicit segments of the reaction constitute what we call an emotion.

States of fear and anger are brought on by inhibition of digestive (and sex) functions. Unpleasant states are defense states, and the life sustaining functions of digestion stop temporarily in order to make more blood available for the skeletal muscles. We all know how an impairment of digestion, due to a dietary indiscretion, predisposes us to sadness or anger, and how sadness or anger due to extra-organic causes can lead to digestive difficulties.

What determines the particular reaction to a given stimulus (person, object, or treatment)? Barring certain apparently inherited reaction patterns, the reflexes, a particular reaction is determined by previous reactions of the individual to stimulus situations having a common element with the stimulus situation eliciting the particular reaction. In other words, the complete response to a complex stimulus can be elicited by merely part of the complex stimulus. This reaction to partial clues is known as redintegration,[3] or less appropriately, conditioning. To exemplify with an actual case: A woman was very seriously affected by the death of her mother. Most of the day of the funeral she spent in her hotel room, during which time she was continually subjected to the chimes of church bells close by the hotel. For several years thereafter, until cured by a psychiatrist, the mere sound of church bells *anywhere* served to make the patient desperately gloomy. Here, a partial stimulus (the sound of the bells) elicited (redintegrated) the entire response (sadness), which previously required the whole stimulus (mother's death, funeral, neighbors' sympathy, together with the church bells). This mechanism is basic to all learning habit formation, and in short, to practically all of our reactions to our environment.

Psychotherapy depends on this mechanism. That is, we desire to obtain a pleasant response by the patient to the treatment, a feeling that what we are doing will do him good, thus predisposing him to the feeling that it has done him some good after the treatment is over, regardless of any specific improvement. If there is no organic improvement, it will be objectively ascertained, and changes in treatment instituted accordingly. It is imperative that the patient remain ignorant of the impotence of any treatment that has been discontinued for that reason; he must always feel that the treatment he is receiving is simply better than the previous treat-

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ment, that his condition necessitated the change. An ability to induce such a response in a patient is frequently essential in physical medicine when a piece of equipment breaks down and another method of treatment has to be substituted. The patient must feel that the substitute is just as good as the original. The conditioning of the pleasant reaction to the treatment, in any case, is accomplished by identifying the treatment with a stimulus situation (of which the treatment is a part) which previously elicited a pleasant reaction. As a result merely the thought of treatment (partial stimulus) will redintegrate a feeling of confidence and approach.

Conditioning of pleasant reactions to the treatment is more than a mere "psychic" affair. We have seen how pleasant states represent physiological well being, and unpleasant states the opposite. What worry can do for a man's body has already been mentioned. No matter, then, what the nature of the malady, a well functioning digestive system is one of the greatest bulwarks against it; and this cannot exist with the patient worrying. We see then how psychotherapy has definite extensive organic effects, and bears out the writer's statement that there is little basic difference between mental and physical treatment.

PRACTICAL APPLICATIONS

We are now prepared to discuss the factors upon which the building up of this pleasant attitude depends. These factors will be considered from a physical therapeutic angle, but the principles underlying them can be applied in any patient-operator relationship in medicine. First let us take the direct physical concomitants of the treatment, which although taught as part of actual technique, are too frequently neglected in practise. The patient's attire for example: Too often a patient is prepared for a whirlpool bath or infra-red treatment to the legs, by simply rolling up his trousers, the vest, shirt, collar (even the coat at times) being left on, thus bringing on a state approaching collapse due to the extreme overheating and confined perspiration which is sure to follow. In order to reduce criticism to a minimum, suffice it that for the average treatment, the patient would benefit greatly by completely disrobing, the technician using sheets and blankets as the particular case warrants. Let us not forget that it is a delight to don dry clothing after any treatment, and that no matter how good a treatment is per se, its effects are diminished if the patient leaves in discomfort.

There are few things that make more for the patient's comfort during the treatment than the judicious application of pillows. It is surprising to see the relaxation effected by placing a small pillow under the knees for example. Certainly there is a need for relaxation in order that the patient may derive the maximal benefit from any physical therapeutic procedure. Such factors as lighting, airing, and temperature of the treatment room are extremely important but are known well enough to preclude more than mention here.

An essential feature of the patient's environment while he is receiving the treatment is reading material, but reading material of light vein, such as short stories, and humorous articles. Popular books and magazines on medical topics should be kept out of the patient's reach since these only serve to redirect his attention to his own condition, and tend to make him believe that he suffers from the conditions of which he reads.

The most effective psychotherapeutic agent is the behavior of the operator in the presence of the patient, particularly his conversation. This pertains more to the technician or nurse, since their training is usually deficient in this regard, and because they spend more time with the patient than the physician in charge. No patient is so intelligent or so well balanced psychologically that he cannot be helped psychotherapeutically through the medium of conversation. The formula to bear in mind is this: the more stupid and credulous the patient, the more obviously psychotherapeutic may the technician's conversation be, even to the point of inspiring awe. In all cases, the technician should move about and handle patient and equipment with poise and confidence, conversation directed to diverting pleasant topics, such as sports. Nothing endears physician or technician more than his or her agreement with one of the patient's political views. The rational application of this principle is profitable not only from a therapeutic standpoint, but also in controlling the behavior of individuals generally.

The question is often asked, "What should be the technician's attitude to the patient's symptoms?" It is best to minimize the symptoms in definite organic diseases for obvious reasons, but where a neurosis or psychoneurosis is involved or suspected, no symptom should be disparaged for a reason which will be discussed presently. However, by minimization is not meant slighting or disregarding symptoms. In fact, the patient in physical medicine even more than in other specialties, should have a good idea of what to expect in regard to duration of treatments, and possible degree of improvement. This precludes disappointment later. The patient should be conditioned to the fact that his symptoms are in no way exceptional, that they are natural under the particular conditions. If this safe attitude is established, the patient will feel undoubtedly that the treatment is doing him good, for, no matter how slow the improvement, the original and untoward symptoms are (in his mind) to be expected.

THE TREATMENT OF FUNCTIONAL NERVOUS DISORDERS

A different modus operandi should be used in the treatment of the psychoneuroses, and in order to appreciate this difference, the psychoneurotic personality should first be discussed. The characteristic common to all psychoneurotic behavior is, that there is a disproportionate reaction to the elements of a stimulus situation. The neurotic individual overreacts to one element in his environment, the other partial stimuli being relatively neglected.

The case cited above exemplifies this characteristic. It will be recalled that the patient in question would become extremely depressed upon hearing church bells, because at one time church bells were associated with the death of her mother. This behavior is psychoneurotic because a normal person in the same environment would react to less depressing elements besides the bells, so that even though reminded (redintegration) of the funeral, the responses to more pleasant partial stimuli would make for a moderate total response to the whole stimulus situation.

The various phobias, when not part of psychotic symptoms are simply abnormal reaction trends of this nature. In claustrophobia, for example, the individual is frightened when in an enclosed space, regardless of the obvious safety of his position. Here we can readily recognize an overreaction to a part of a stimulus situation, namely, the thought of confinement, and a total disregard for the other elements which indicate the safety of the situation.

These so-called functional disorders range from marked somatic involvements, known as the hysterias,

to almost purely emotional or mental types such as the examples discussed above. One should realize that psychneurotic behavior differs from normal behavior only in degree, that we all behave psychoneurotically at times. No person's behavior is perfectly integrated. No person responds to all the elements of a given stimulus situation in proportion to their relative importance, since conditioning of response to stimulus is neither a rational nor an irrational process. It is non-rational, and it is precisely on this point we base the promise that any patient can be helped psychologically. The more integrated individuals are less affected by this procedure, the more dissociated or psychoneurotic personalities are affected most (excluding, of course, psychotic involvement). Just as he overreacts to the stimuli which bring on his condition, so can the psychoneurotic be made to overreact to the value of the treatment, to the extent of curing the disturbance.

Some of the devices for effecting this overreaction have already been presented, but in order to describe the technique to be used where the disorder is purely functional in nature, it will be best to discuss the treatment of two interesting cases of hysteria seen recently in the clinic. These conditions, although representing the most exaggerated type of psychogenic disease, best illustrate the psychology of the psychoneurosis as well as the indicated therapy.

TREATMENT OF FUNCTIONAL NERVOUS DISEASE: TWO CASES OF HYSTERIA

Case I—Man, age seventy, was referred to the clinic because of "psychogenic belching." During his conversation and first two treatments, he would at irregular intervals gasp in a sudden convulsive manner, the sound emitted being pulmonary in origin in spite of its name and character. The patient was a pleasant old man, rather effeminate, and as is typical in such cases, quite stupid and gullible. The physical therapeutic treatment ordered consisted of in fra-red radiations, followed by electrical stimulation which was alternated with static sparks, and the treatment concluded with massage. The patient was made to feel that his symptoms were just as serious as he (the patient) believed, being assured, however, that although his condition was rare, two identical cases were completely cured that month with just six treatments, such was the potency of heat and electricity. The treatment was made as ceremonious as possible; the hysteric was awed by the ritualistic excursions of the electrode or static spark applicator. Throughout the treatment, conversation was directed to the marvellous effects of electricity, light waves, and massage. No symptoms were observed after the second treatment, but the patient complained of several paroxysms which occurred at home. A complete remission was effected after the sixth treatment, treatments having been given every other day. The patient has been seen twice in the last year and stated that there had been no recurrence of the disorder.

Case II—Young man, age about thirty-five, hospitalized with hysterical pains in occipital region and shooting pains down the spine, also inability to get out of bed. The neurologist in charge of the case informed us that the symptomatology was psychogenic and needed extremely energetic psychotherapy. The physical treatment ordered consisted of general massage, needle shower, and Scotch douche. Before having the patient brought down for the treatment, he was visited in his room by the technician. Approached by the technician with the most audacious bedside manner, which would certainly have appeared ridiculous to an intelligent well-balanced patient, the patient was told that his symptoms were indeed serious, but that the next morning he would get out of bed without any assistance, that is, he was to receive the most marvellous treatment known to medical science. As the patient was brought into the hydrotherapy department, and an attempt made to transfer him from the stretcher to the table, he was siezed with violent convulsions and rigidity of the entire body; his eyes stared wildly, his mouth frothed, and he perspired profusely. Gentle sedative massage, ceremonious in character was immediately begun. Conversation throughout the treatment was soothing and consisted chiefly of admiration for the patient's resistance and excellent muscle tone, and the omnipotence of hydro-therapy and massage. When the massage was over, the patient was instructed to get up from the bed and step into the shower stall. This was accomplished with a little assistance from the operator. At this point the patient still complained of occipital pain, whereupon he was told in a very dramatic manner how this pain would gradually disappear as the douche sprayed up and down his spine. The patient stepped from the shower stall with merely a slight vestige of pain and a little unsteadiness but with no assistance from the operator. The next morning he was discharged.

Three important rules which can be applied generally in the treatment of psychogenic disorders—especially hysteria—have been illustrated by the discussion of these two cases. One must always bear in mind, however, the necessity of modifying method to suit individual needs. The rules are as follows:

I. No psychoneurotic symptom should be minimized or ridiculed until something greater in effective importance can be substituted for it in the patient's mind. This "something greater" is the patient's reaction to our treatment. The neurotic is a self-centered individual who is always seeking to increase his importance, hence he creates and exaggerates all sorts of disturbances in order to attain this end. We should not confuse this practice with malingering; hysterical symptoms appear without premeditation on the patient's part. By openly admitting the seriousness of the symptoms, we are immediately taken into the patient's confidence. From this point, the object of our treatment is to replace the feeling of being seriously ill by the feeling of being miraculously cured. Your neurotic feels proud of being cured by some exceptional operation, by a strange ray, or by a certain machine with revolving wheels and sparks. In psychotherapy we have frequently to substitute for an abnormal reaction tendency an equally exaggerated but more salutary reaction tendency. We cannot—in spite of many pseudo-authoritative opinions—rely solely on the impressiveness of our equipment to produce this change; we must direct and assist the patient in forming new attitudes or reaction tendencies.

II. The technician must be definite and ultra-confident in encouraging the patient. There should be no "perhaps" and "ifs" in telling a psychoneurotic what to expect. For a physician to adopt this attitude in general practice would constitute nothing short of quackery, but where symptoms are psychogenic in origin, one need hardly be conservative in prognosing.

III. At no time must we show surprise or alarm at the severity of any symptom. In the case of one of the patients discussed above, the symptoms were actually terrifying, but surprise and uncertainty

would indicate unfamiliarity with the condition. No patient will have confidence in the doctor who acts as if he were treating the particular malady for the first time.

Not all psychogenic disorders will lend themselves as readily to treatment, nor will such excellent results be obtained in so short a period of time as in the two cases presented above. Hysteria is far easier to treat than most other types of functional nervous disease. Painstaking and persistent psychotherapy taking many months and, at times years, is found necessary in the treatment of conditions such as neurasthenia, the anxiety states, and other syndromes coming under the popular head of "nervous breakdown." These recalcitrant neuroses require the continual attention of a neuro-psychiatrist who is especially trained in normal and abnormal psychology and in psychotherapy. The technician, however, must know more than his or her technical role in order to assist the physician with the task of redirecting and expanding the patient's interests, which is of far more importance than any physiotherapeutic measure which may be prescribed. To provide such assistance, the technician should study the patient, be thoroughly acquainted with all the factors basic to his disease, and to act in accordance with the psychological principles discussed in this paper.[4]

PSYCHOTHERAPY IN THE ADMINISTRATION OF CORRECTIVE EXERCISES

There is no other phase of physical medicine in which it is as difficult to enlist the patient's cooperation as in the treatment of anatomical anomalies. Lack of cooperation is due to several causes, most of which can be controlled by the operator. One of the principal factors is the lack of discrimination in regard to the capacity of the individual patient, child or adult. The error in most cases consists in overburdening the patient with too many exercises. Individuals differ in neuro-muscular development, hence they differ in ability to learn new coordinations. The ease of mastery of exercises, quantitatively and qualitatively, is closely correlated to the general intelligence of the patients. This conclusion has been found to be well supported by authoritative data. If a child or adult is given too many exercises, or too difficult ones, he will feel that he is not progressing as well as he should, will worry about his condition, and lose interest in the treatment. Children particularly can be driven to the point of neurosis by too complex a dose of exercises which they cannot master. It is essential that the patient get the pleasure of mastery, that is, by overcoming the difficulty of the particular exercise. One will find it advantageous to have the child or adult demonstrate his exercises before a small audience; no appeal is greater than that to our "exhibitionist" tendencies. A procedure which may be used quite invariably consists in first getting the patient *en rapport*. This can usually be accomplished by the end of the second session. It can be done readily by stressing the importance of the exercise, by appealing to the male's virility and to the female's desire for attractiveness. The instructions for at least the first three sessions should consist simply of training in posture and in proper walking, the patient being encouraged and complimented after every sign of improvement. At no time must the operator disparage or severely criticize the efforts of the patient.

With children, it is desirable that a parent attend the first five or six sessions in order to enable him or her to supervise the child's practice at home. One of the greatest difficulties we have to overcome is the callous indifference of many parents to serious postural deformities of their children. It is therefore necessary to educate the parents as well as the children who are referred for posture training or corrective exercises.

Exercises should be added to the patient's repertoire one at a time, and in few cases is it necessary to give the patient more than six different exercises to practice in one session. Six well-selected exercises can effect a better improvement than fifteen chosen on the basis of providing an impressive dose. We must not forget that school, business, and other activities tax the patient's memory sufficiently, hence we need not add the burden of a dozen superfluous exercises.

In pescribing exercises for practice at home, the doses must be definitely stated. They must be as specific as doses of drugs; the operator must never rely on the patient's judgment. Such suggestions as "Do this to the point of fatigue," are quite useless; the measure is certain to be overworked or insufficiently practiced. Moreover the patient cannot help feeling that the dosage is unimportant; hence the impression that the exercise is unimportant. When, however, an exercise has to be done fifteen times, three times a day, the patient will not dare to deviate from this dose, feeling that unless he adheres strictly to the prescription, the exercise will fail. No doubt the public's confidence in drugs is to a great extent due to the imputed importance of specific doses, not entirely to the actual results derived from their consumption. An exercise, then, is to be prescribed like a drug in order to attain the most effective results, psychologically as well as organically.

Another good general rule which is of value in handling these long drawn-out cases is that the operator should frequently perform the exercises with the patient; and with children, it is wise to have the parent do the same at home. Certainly at the first session, the technician should demonstrate a series of movements, telling the patient that he will soon perform them as well as he. On several occasions complete rapport has been established with the patient at the first treatment simply by demonstrating several impressive exercises. To review: the technique consists of starting with a few general instructions, then increasing the complexity and quantity of work according to the individual's ability to master the previous instructions, to prescribe specific doses of daily work at home, and at all times to encourage the patient to greater attainment.

SUMMARY AND CONCLUSIONS

I. Since a patient's reaction to a treatment is principally an emotional matter, that is, it is non-rational, psychotherapy is a very effective agent in the hands of a well-trained technician, not only in the treatment of psychogenic disorders but also in the treatment of organic conditions. It is essential that the patient believe he is improving regardless of the exact state of affairs in his particular ailment. The technician should be a psychotherapist, since he spends a relatively long time in the patient's presence, and can therefore affect the patient's outlook to a great extent.

II. Several definite general rules have been discussed, but for the most part the psychotherapeutic technique should vary with the type and condition of patient just as the physical therapeutic measure varies with the condition and patient. With intelligent discriminating patients little psychic stimulation, as such, is required; with credulous individuals, the psychological element should be dominant in the treatment.

III. Although it is understood that it is the duty

of the referring physician to give the technician specific instructions in regard to mental treatment, particularly where there is a distinct neurotic involvement, such instruction is frequently overlooked. It is therefore the responsibility of the technician to study the mental symptoms of every case, and to analyze the patient's personality. In order better to qualify the technician for these duties, his training in psychology and psychotherapy should be elaborated. He must also consult frequently with the physician and seek his advice on problems met in treatment.

IV. We should make every effort to dispel the air of mysticism which adheres to things mental. Mental disturbances differ from normal behavior processes only in degree; identical psychological mechanisms operate in both types. The chasm which separated the "mental" from the "physical" was a fantasy resulting from ignorance and superstition. We know now that mental functions are dependent on organic structures, that mental disease can lead to organic disease and is inseparable therefrom. It is from a consideration of these facts that we can attribute to psychotherapy a tangible value in the practice of physical therapy.

1. Crile, George, in lecture delivered at Temple University, May 24, 1934.

2. Lund, F. H., *Emotions of Men*, pp. 19 to 131. See reference list at end of paper.

3. This term is borrowed from Hollingworth. (See reference list.)

4. For a splendid discussion on the psychoneurotic personality, see Hollingworth's *Abnormal Psychology*.

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For the reader who desires a broad scientific approach to the psychology of psychotherapy as well as to psychotherapy per se, the following works are recommended. They are arranged in order of progressive difficulty. Nos. II, III and IV are specially interesting and informative.

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Swedish Schools of Physical Education and Physical Therapy

Bernice Ringman

During the summer of 1933, I spent several months in Sweden where I had the opportunity of visiting several institutions which have contributed much to the advancement of physical education and the related sciences.

The Swedish schools differ from ours in as much as physical education training is combined with the physical therapy course. At the present time there are three accredited schools of physical therapy in Sweden.

These institutions are:

Kungliga Gymnastiska Central Institute or "Royal Central Gymnastic Institute" which is supported and supervised by the government.

The Sydsvenska Gymnastik Institutet or "The Gymnastic Institute of Southern Sweden," which, a private institution, is supported and supervised by the government and affiliated with the Medical School of the University of Lund.

Arvidsons Gymnastik Institut or "Arvidsons Gymnastic Institute," a private institution, lesser in scope than the two previously mentioned but parallel in aim.

The Royal Central Gymnastic Institute:

This institution which has a two-year course for women and a three-year course for men requires a previous scholastic training equivalent to fourteen or fifteen years in our schools, or that of a student of a junior college. The age of the student when entering the school must be between twenty and thirty years of age. The tuition is free.

Theory courses are offered in the following subjects:

- Anatomy
- Physiology
- Pedagogy
- Pathology
- Hygiene
- First Aid
- Physical Therapy
- Games
- Sports

Practical courses in the following:

- Pedagogy of gymnastics
- Physical Therapy
- Games
- Fencing
- Sports
  - Swimming
  - Skiing
  - Skating
  - Orientation and Map reading
  - Soccer football
  - Scouting
  - General sports

In accordance to European tradition this school, as well as the two others, is a strictly professional institution. Therefore no electives in the American sense are given but it is assumed that the student, due to his previous training, has mastered corresponding subjects. The medical subjects are taught by physicians of high standing.

The Gymnastic Institute of Southern Sweden:

This school which is not co-educational has a two-year course for women. It requires somewhat less of previous training than the Central Institute. There is

an upper age limit of thirty years of age. The tuition fee approaches that of an American state university. The curriculum of this school includes the following:

Theory courses:

- Anatomy
- Physiology
- Hygiene
- Pathology with demonstration
- Kinesiology
- Clinical examination and diagnosis
- First Aid
- Medical Gymnastics
- Physical Therapy and Massage
- Theory of Physical Education
- Educational gymnastics
- Psychology and pedagogy
- Principles of teaching

Practical courses:

- Games
- Educational gymnastics
- Athletics
- Folk dancing
- Swimming
- Skiing
- Camping
- Orientation and Map Reading
- Natural Dancing and Rhythmics
- Fencing
- Practice Teaching of Gymnastics, etc.

This school puts more emphasis on the physical therapy work than does the Central Institute. This because it has the good fortune of being situated in a city equipped with one of the finest medical schools in Scandinavia and also possessing five modern hospitals. There are six physicians on the faculty. This enables the school to give its students practical experience under the close supervision of doctors and trained physical therapists.

Arvidsons Gymnastic Institute:

I had no opportunity of studying the Arvidson School but I understand that it is similar to the two larger institutions.

Summer Courses:

There are no special courses offered to physical therapists at any of these institutions during the summer months but the summer courses in physical education given by the Gymnastic Institute of Southern Sweden is quite widely attended by foreigners. There may be courses offered by smaller institutions, however, I heard of none. While at Lund I spoke to one of the faculty members of the school and asked her if an American student could take a one year course in physical therapy. She said that it might be arranged providing the applicant had taken enough prerequisites and knew the language to some extent.

Orthopedic Hospitals and Institutions:

There are four large institutions for crippled children in Sweden. These are located in Stockholm, Gothenburg, Halsinborg, and Harnosand. These institutions are very similar to our orthopedic hospitals in many respects. Most interesting were the trade schools that were sponsored in conjunction with the corrective treatment. All types of trades and professions were taught to the patients. Many are given positions in some parts of the city or the country. I enjoyed watching the physical therapists giving treatment to many of the patients.

The general impression which I have retained is one of thoroughness and serious application. The methods and equipment used are quite on par with the American ones. Incidentally, I did not see much hydrotherapy work done at any institution.

Fatigue As a Factor in Disease

R. W. Larer, M. D.

Do we fail in our output or effort because we are physically below par? Are we ill because we are tired or are we tired because we are ill? These are vital questions to be answered in our effort to find causes of disease and in our effort to master it. In either the cause of disease or the results of disease or disease itself, particularly in industry, we find fatigue playing a very important role.

Fatigue is a corporeal condition which should be taken account of in all human activities. This, as I just mentioned, is particularly true in industry and here its importance is being recognized more every day. It is true that industry provides us with a great majority of our cases of so called illness or disease, and while we all are workers, yet not all of us are classified as industrial workers but are nevertheless subject to the process of fatigue. Hence fatigue should be studied as related to life or all forms of endeavor, not exclusively to industry.

In the human, fatigue has two aspects, subjective and objective, and hence must be considered from the standpoint of the physical and the psychic. After an individual has been active mentally or physically, he feels tired, and that to him is fatigue and is a matter of sensation and his sensations are the sole measure of his weariness. He has no comprehension of any material changes in his body, yet changes of importance have occurred. Many of the changes are unrecognized and both the physical and psychic are in need of intensive investigation.

Fatigue may be described or defined as a diminished capacity for work, which is the result of previous work. You may have the lessened capacity for work even if previous work has not been engaged in. A rather common twentieth century condition! Disease may put the body in such a condition that the capacity for work is lessened, as will lack of food. The excessive use of one group of muscles may diminish the power of other muscles, or of the brain to work.

The diminished capacity for work that appears in living substance engaged in activity is a sequence of chemical changes that occur in the substance and are part of its metabolism. These chemical changes involve the physical and psychic, and in general are of two kinds: First, material that is essential to activity is gradually used up and thus the available material is gradually exhausted, and if this process continues without new material being added or supplied, activity must

necessarily cease. Secondly, there appear katobolites, or products of activity, which are detrimental to the living substance and if allowed to accumulate gradually diminish working power and are called fatigue substances. These two processes constitute the chemical causes of fatigue. They occur simultaneously and in a given instance it is hardly possible to determine their relative importance.

The distribution of the blood in the body is probably altered by a long continued fatiguing task. By the end of a hard day's work much blood has probably been drained away into the viscera and the limbs and the brain are left relatively anaemic, and this doubtless accounts in part for the sleepiness which is then present. In this way fatigue of one part of the body may induce the phenomena of fatigue in other parts of the body. A person who has worked sufficiently hard to tire his body may have a tired brain as well and the exhausted brain worker is in no condition for performing hard physical labor. A change of labor is often beneficial as a temporary means or expedient to relieve a part of the body which is in danger of becoming exhausted, but there are limits to the possibility of such benefits and it should be borne in mind that excessive work by one part may mean a certain degree of fatigue for all parts.

A feeling of fatigue may induce a disinclination for work and even a powerful aversion to it, and this may diminish the amount of work accomplished, although at the same time not decreasing the working capacity. A slight change in one's mental state often makes a great difference in achievement. Soldiers march further and with less fatigue with music. In six day bicycle races the average in a day's observation was eighteen and eight-tenths miles per hour but when band accompanied, twenty-one miles per hour were observed. Reading, music in factories where keen mentality, close observance of the most minute detail, close scrutiny, or care to avoid danger of accident, either to the individual or the material under process of manufacture, or the physical part or parts of the plant is an essential, is beneficial; people are more contented, happy, quiet, and their productive ability increased. I have seen these results particularly in some of the large cigar factories in Cuba. There are theories of recovery and tests for fatigue, but I will only take time to mention some of its effects on the human body, particularly as applied to industry.

The connection between disease and fatigue is probably much more frequent and close than is usually understood and recognized. To disease fatigue stands in the nature of both cause and effect. That it may be a factor in causing infectious diseases is often believed, and this belief has been apparently justified by laboratory experiments. My personal belief is that fatigue is more important than infection itself in causing disease, for the obvious reason that fatigue must necessarily decrease bodily resistance which makes the effects on infection possible.

Two sets of rats, were experimented with, one set resting, the other kept active doing muscular work and fatigued by it, and both were inoculated with pathogenic bacteria. The fatigued animals exhibited a marked fall in the obsenic index and succumbed in large numbers. This was interpreted as indicating that the resistance of the body to the action of the bacteria was diminished by the metabolic changes in the process of fatigue. Besides infection, fatigue as a causing factor in disease is obvious in neurasthenia. The most common single precedent in this form of neurosis is the excessive activity of the nervous system. Continued muscular fatigue if it is without accompanying excessive excitation of the nervous system probably cannot induce neurasthenia. The nervous system is the primary seat of the preceding fatigue process. There are, of course, many contributing factors or causes but overwork, over pressure, over strain are the positive factors preceding a nervous breakdown. The immediate causative factors or relation of fatigue to other diseases is not clearly understood or established but the general trend of modern opinion is that it plays a most important role.

Fatigue in a normal degree is harmless, even a healthy condition, fundamentally metabolic, which involves a normal physiological depression of the function of the body and induces its own termination and a return to a normal capacity for work. This, however, can be carried too far, the destruction of cellular elements, cellular material, and the accumulation of katobolic substances or fatigue substances, also by continued effort or monotonous employment or strained position, unwisely persisted in, without means of relaxation or recuperation, can proceed to a pathological degree at least by depressing influences, and interfere profoundly with the normal metabolic processes of the body. Here is where the foundation of profound disease conditions can be laid.

That fatigue, or at least proneness to fatigue, is an effect of disease cannot be gainsaid, diminished capacity for work is the almost universal accompaniment of diseases involving alterations of the general metabolism, such as infections, febrile diseases, diabetes. Here the loss of substances which are essential to activity is well illustrated by the destructive metabolism of febrile disease and the excretion of sugar in diabetes mellitus. Here, too, there appear certain toxic substances which from their depressing action may be called pathological fatigue substances. This group includes probably bacterial toxins and a considerable number of intermediate metabolic substances derived from the body's own cells. Examples of the pathological substances are oxybutyric acid, common in diabetes and intestinal putrefaction. These substances are known to be depressing to living tissues and whenever they are present in quantity in the body, fatigue is a prominent symptom. Here is a wonderful field for research.

Fatigue plays an important role in industrial occupation, diminishing industrial output. A worker may lose time for two reasons: First, causes over which he has no control, such as breakdown of machinery or waiting for material. Second, causes dependent on his own volition, absence from work, delayed arrival, early leaving, deliberate cessation of work in the midst of the working period; and here fatigue is a prominent factor. The United States Government made a survey of eight and ten hour a day plants. In the eight hour day they began more regularly on time and lost time was reduced to a minimum. Ten hour a day plants started later and stopped earlier and much time was lost during the working periods, particularly in the afternoon periods. Even where diminution of output is not present and where specific diseases cannot be traced directly to the fatigue of labor, it is undoubted that industrial overwork occurs often and puts the worker in a physical condition where his physical mechanism is in a state of depression and ready to fall prey to specific maladies. Fatigue is expected from certain specific characteristics of modern machinery. The great division of labor, consequently specialization of the work of each individual, long periods of work, poor posture, cramped postures, overwork, piece work or the speeding up of work, are necessary for the individual in order to keep pace with modern machinery, crowding together of large numbers of

human beings within confined spaces, often poorly ventilated.

Modern methods have in many instances replaced by machinery the heavy lifting from the worker to the machine, but while some industries still require the expenditure of muscular force by the worker, it has been replaced by a new element which is no less fatiguing —speed. Thus in making hinges, a woman lifts a half-formed hinge, places it in a bending machine and quickly withdraws her hand and repeats this series of movements fifty times a minute or 30,000 times a day. The tops of tin cans are cut by pressing the lever of a foot press forty times a minute, 24,000 times a day.

A telephone operator can answer and make connections for two hundred to three hundred calls an hour. We who are calling exhibit temper if for any reason an operator seems stupid or tardy with our single call. We should consider her fatigued brain and tired muscles. In weaving, a woman may supervise several looms, watching to see that they are all properly running. In sewing a girl watches twelve jumping needles of her modern power machine. This same procedure is gone through in topping and looping in a stocking factory. In making of women's garments an operator will, in an hour, tuck two hundred fifty yards of lawn while another will hem four hundred yards of voile.

In candy manufacture a girl will wrap nine thousand caramels a day. In a cigar factory a man will bunch twenty thousand stogies. An expert can in a day insert eyelets in four thousand shoes, another can trim superflous leather from uppers of five thousand two hundred shoes. All of these examples show or give evidence of a monotonous routine performance and expenditure of energy, plus the necessary speed. Where a worker does nothing but these special labors his activities are confined to a limited or small part of his body, to a restricted neuromuscular mechanism, which undergoes a rapid rhythmic exercise. In some instances it simply becomes a mechanical act while in others in addition to the mechanical effort, it demands an acutely attentive consciousness, with a double strain of the physical and the neuro-mental activities. The danger lies in the fact that the pace may become so rapid that there is little opportunity such as usually exists with the rhythmically beating heart for recuperation between successive discharges of energy. This fact or these factors enumerated are not only possible in the industrial worker, or in so-called labor, but the brain worker may also be the victim of similar effects having the same causing conditions by the continued use of the mental part of his being plus concentration and monotonous effort producing fatigue substances and metabolic changes. The accompanying fatigue which if continued means a lowered resistance and increased susceptibility to disease. These accumulations of waste products in the blood as result of muscular wear and tear or brain activity together with the expenditure of nervous energy combined render the body an easy prey to infection and diseases which gain their start as a result of lowered vitality. The speeding up process is particularly a factor, the hurry, working under pressure, plus anxiety, fear, worry bad habits, dissipation, vice, loss of sleep are all vital factors in the production of fatigue.

The most pernicious factor is the speeding up. Men in order to meet competition, low prices, high profits, and trade supremacy, speed themselves up and demand speeding up by others. Genius tries to increase the speed and output of machinery and the employed have to keep pace in physical and mental way with the machine. The high pressure of modern civilization, industry, and of the arts and sciences, plus acute competition and the necessity of gaining knowledge, experience, prestige, and wealth, or a mere livelihood stimulates men to overdo their physical, mental, and nervous strength and produces some of the forms of neurasthenia and the consequent fatigue. The general effects of overwork and chronic fatigue are loss of appetite, insomnia, anaemia, digestive disturbances, circulatory disorders, respiratory and cardiac derangements, fatigue neuroses, neurasthenia and general health deterioration. This condition of chronic fatigue was supposed to be confined to or rather peculiar to professional or men of large affairs or the wealthy unemployed; but among men who know, it is found that fatigue is usually present in the workers of industry. All one has to do to be convinced of this is to have the opportunity of inspecting many of the various forms of human endeavor to be convinced of the great prominence of fatigue among the industries and the reason for it is quite obvious. All forms of endeavor should be selected and regulated according to the capacity of the individual and the ability to perform any given employment. Preventive measures consist of proper rest, proper food, regular habits, proper hygiene, proper ventilation in places of employment, regular sleep, variety, relief from monotony, changes of work in dangerous or monotonous employment, change of work when hygiene is poor or positions are cramped. Life without daily purposeful effort is wrong.

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Exhibits

It is not too early to begin talking about and planning for the convention next spring—not too early to begin thinking about the exhibit you will have there. Some of the exhibits at the past convention showed a great deal of care and work in their preparation. They were quite worthwhile. Therefore, we are reminding the chapters, and the individual members, that they may begin at once to make that part of the next convention an interesting one.

The exhibit room at Cleveland was one of the features of the convention. It was something practical and tangible. One could go in there at any leisure moments and glance through the books or examine the charts or inspect the apparatus (home-made perhaps) or look at the pictures and photographs. In there one could meet other members or guests, and could discuss and appraise the things on exhibit. One could get "ideas" —after all, the reason for a convention.

But good as was this last exhibit, it is hoped that the next will be even better—that more chapters and individuals will bring or send in things to show what they are doing and what they are thinking about. It is a bit of advertising for those sending the exhibits and it is a help and inspiration to those who see the work. Indeed, the exhibits may, to some people, prove to be even more of an education than the formal lectures. Certainly, they are an important part of the convention.

Examinations Offered

An examination will be offered in March (exact date to be announced later), to those desiring membership in the American Physiotherapy Association whose training or prerequisites do not meet the constitutional requirements, but are equivalent. Application may be made to the nearest chapter or to Miss Lucile Grunewald, 1411 Mar Vista Avenue, Pasadena, Calif.

All applications must be finally accepted by the National Executive Committee. Fee of ten dollars must accompany application. Fee will be returned if application is not accepted, or if for any reason applicant is unable to take the examination, providing the Executive Committee is notified at least one week before the date of the examination.

Wilhelmine G. Wright

The announcement of the death, on August twenty-fourth of Miss Wilhelmine G. Wright came as a great shock and brought with it a very real sense of personal loss to many of our members and friends.

Those of us who had the rare privilege of being trained by her and of working with her can never measure in words what her inspiration and personality meant to us—to say nothing of her knowledge of orthopedic problems. Particularly well known was her ability in the after-care of poliomyelitis which she systematized with the help of Dr. Robert W. Lovett. People from many states and from several foreign countries will feel the loss of her suggestions and encouragement in their struggle toward rehabilitation.

Miss Wright's character and habits are well protrayed in the following article taken from an August issue of a Boston paper:

> "The name of Wilhelmine G. Wright will mean little to those whose knowledge of the world is derived wholly from the newspapers, but her death will renew, halfway around the world, memories of her intelligence in helping people who were crippled. They will remember her as a character, tall, light-haired, tremendously active, whether climbing mountains or chopping wood, who could read scientific articles in any of a dozen languages in the pursuit of her profession and to whose credit goes work in the first winter research in infantile paralysis in Vermont. It took such a person of strong and original point of view to carry through the work which came to her from snowy roads and lonely farms. Her detachment did not lose the humanity from which she seemed to be separated from people in their frailty. She had none of that.
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> "She was indefatigable in her interests. She was one of the pioneers when Dr. Robert W. Lovett called on her to translate into practical procedure for farmers' wives the scientific work that had been done in muscle training. She contributed to a system of muscle training for handicapped people to

an extent that can be suggested only by the fact that many notable persons knew her and benefited by her skill.

"Because little or nothing of her life was printed at her death, the simple record is that she went to Boston Normal School of Gymnastics, from which she was graduated in 1905, and later to Berlin to complete her formal education in the clinic of Professor Hoffa. Dr. Lovett, who died in 1924, gave her distinguished recognition in the first book ever written on the after-care of infantile paralysis.

"That she died suddenly was in keeping with her life. There were always admirations for her which have found words only with her death. She was a great person in that she had a direction for the intelligence and strength by which she lived. A woman who toiled over children from snowed-in farm houses in Vermont equally with those of Fifth and Commonwealth avenues, who climbed the Alps for joy, and who read Russian poetry for tragedy, ought not to die at forty-eight."

Dr. James T. Watkins

In February, 1934, Dr. James T. Watkins of San Francisco passed away after a short illness.

During the World War, Dr. Watkins was a member of the board which examined applicants for Army Reconstruction Aide Service. From that time until his death, he interested himself in our Association and was a friend, indeed, with his kindly and constructive advice and often active defense, in the early days of our organization. The girls who had the opportunity of coming in contact with him counted him Friend and Counsellor, and cherish many memories of his unselfish expenditure of time, energy and loyalty in their behalf. Therefore, it is with a deep feeling of personal loss that the Northern California Branch of the Association contemplates the death of our beloved honorary member, Dr. James T. Watkins of San Francisco.

Books are yours,
Within these silent chambers treasure lies
Preserved from age to age; more precious far
Than acumulated store of gold
And Orient gems, which for a day of need
The sultan hides, deep in ancestral tombs.
The hoards of truth you can unlock at will.

—*Wordsworth.*

Chapter News

Central New York

The Central New York Chapter is at present largely concerned with problems of organization. You may appreciate something of our problem when we tell you that in the city of Syracuse alone there are twenty-four physical therapists known to us. Eleven of these—all men—have a state license and an organization of their own with standards and a reputation quite different from what we are trying to build up. Out of the group of twenty-four, only four of us are members of the American Physiotherapy Association. The situation is similar in Utica and to a less extent in Ithaca.

While we were not accepted as a Chapter until the past June, we conducted monthly meetings last year, throwing them open to interested persons. Our program plans for the year are not complete, but we have had one lecture to date: Athletic Injuries, by Dr. Paul Laurie of Syracuse University.

Chicago

Regular meeting October third—dinner, business, discussion of plans for year. A drive for memberships among eligible physical therapists to be made; social gatherings planned in addition to business meetings and lectures; courses of lectures to be given to those interested.

The first course is now being given—a course of eight lectures and demonstrations in anatomy arranged through Northwestern University. Two sections had to be arranged to accommodate the number of members wishing to take the course.

Cleveland

Regular meeting was held October sixteenth—dinner followed by business. Programs for the year were discussed and a committee was appointed to arrange lectures and entertainment.

The question of reorganization into an Ohio Chapter was brought before the meeting. After a lively discussion, the vote in favor of reorganization—the Chapter to include the entire state of Ohio—was unanimous. To study ways and means of reorganization and to make a report at the next meeting, a committee was appointed.

At the request of the Committee in Charge of the Community Fund Campaign, plans were made for an exhibit of physical therapy as a service the hospitals extend to the public.

District of Columbia

The District of Columbia Chapter held its first meeting on October second, and will continue holding monthly meetings on the first Tuesday of the month during the winter. The first meeting was devoted entirely to business, but we expect to follow our usual custom of having a talk by some member of the medical profession at each meeting, followed by the usual business. The doctors of Washington have been most cooperative, and we have had many interesting talks. Dr. Dunlop P. Pengallow will be the November speaker.

Miss Moore of the Weightman School for Crippled Children visited a similar school in Montreal recently.

Several of our members attended the meetings of the American Congress of Physical Therapy held in Philadelphia this fall.

Massachusetts

The Massachusetts Chapter has had only one meeting this fall. This was held at the Physiotherapy Dept., of the Children's Hospital. The members were taken on a tour through the Bader Building, which is given over entirely to physical therapy.

The November meeting will be held at the Robert Breck Brigham Hospital where Dr. John G. Kuhns will give a lecture on, "Arthritis," with case demonstrations.

We hope to have our program for the year completed in the near future.

New York and New Jersey

The New York and New Jersey Chapters of the American Physiotherapy Association gave a dinner to members and advisory council on October 15th, 1934. The Physicians present were: Dr. Wm. Bierman, Dr. Richard Kovacs, Dr. Charles Brooks, Dr. Madge McGuinness and Dr. K. G. Hanson.

The executive meeting of the New York chapter was held October 23rd, 1934, for the purpose of outlining a program. At the present time the program for 1934 is merely a tentative one.

Oregon

Meeting held on October tenth. It was agreed to continue with Chapter meetings and organization. Third Tuesday of each month is to be the meeting date. The constitution was discussed. Motion was made to offer the services of the members to the City Health Board to make muscle tests and do after-care in the poliomyelitis cases.

Pennsylvania

The first regular meeting of 1934-1935 was held on October fifth at the Institute of the Pennsylvania Hospital for Mental and Nervous Diseases. The members were addressed by Dr. Francis Braceland of the staff of the hospital. The subject of the talk was "The Evolution of Physiotherapy in the Treatment of Mental Diseases." Our chapter has found that lectures by psychiatrists are most interesting and recommends them to other chapters. Not only do they instruct in the use of physical therapy in this field, but they offer many suggestions in the treatment of other nervous and excitable patients.

Although there had been no regular meetings between June and October, the Executive Board was busy. In July, a joint meeting of the Old and the New Board of Directors was held to receive the report of the 1934 National Convention.

The American Congress of Physical Therapy graciously extended an invitation to technicians to attend the various lectures and demonstrations of the annual session, and we were glad to meet members of other chapters there, also.

Southern California

The first meeting of the year was devoted to the Convention, to the revised constitution, and to other high-lights. We now have the National officers right with us.

We are interesting our members in the coming election—not because of the governor, however, but because two bills which may affect our profession are coming up.

Texas

Our chapter has been inactive this fall up to this time, so we haven't much news to report. Our first fall meeting was held October 25. Miss Winifred Moore, who was our secretary-treasurer last year, is doing physical therapy work at St. Joseph's Hospital, Bellingham, Washington. We were so sorry to lose Miss Moore who was such an active worker in our chapter. Marion van Tassel is back with us after being on a case in New York for the past nine months. We are glad to welcome her back.

Washington

The first meeting was held at the Seattle Orthopedic and Fracture Clinic on September twentieth. It was a business session only, including quite a lengthy discussion of the minutes of the National Convention.

This year our meetings are to be held the second Thursday in each month. The second meeting was a "No Host" dinner at the Helen Swope Tea Room on October eleventh. After the dinner there was a round table discussion on the use of short wave diathermy.

Western New York

Regular meeting—July 14, 1934, at The Barn, Le Roy, New York.

This was an informal out-of-door meeting at which the Convention in Cleveland was discussed by our delegate, and others who were there.

Regular meeting—October 13, 1934, in Rochester.

Business meeting and dinner. Lecture—"The History and Application of Gait Measurement," by Mr. Arthur Heath of Strong Memorial Hospital.

Wisconsin

The Wisconsin Chapter of the American Physiotherapy Association now boasts a membership of about forty members. Many new additions and changes will be noted.

Not among the least of these changes has been the wedding of an active member and a former member of the Chapter. We will give this item priority over all other news.

Last winter, Mildred Jacobson forsook Milwaukee for Warms Springs, and July 7th, she left the fate of Warm Springs to others by becoming Mrs. Lawrence Morrison, Jr. Her home is at 95 Christopher Street in New York City.

After the June issue, we received the announcement of the engagement of Jane C. Holt. Since then we hear that the wedding was solemnized this summer. She is now the wife of Bradford E. Gale, who is the minister of the Unitarian Congregational Society in Lincoln. Best wishes for happiness to both girls.

As was announced in the last "edition," Alma Dillon, Ethel Smith, and Alfraetta Wright, all of Milwaukee, who passed the examination for A. P. A. membership will be among those present at our next meeting.

Garland Johnson has deserted Sheboygan and the Wisconsin Chapter for a Hospital position in Akron, Ohio. And we did want to hear about her summer in good old Boston! Fay Henry has taken the position vacated by Garland. Fay was formerly with Miss Borwell at the Madison Orthopedic School, and this position is now held by Mariella Eggler.

Elizabeth Grimm moved to the Children's Hospital at Farmington, Michigan. Olive Farr takes the position left by Elizabeth at the Orthopedic Hospital in Madison. Julia Ernst is working part time at the Orthopedic Hospital also.

ABSTRACTS

John S. Coulter, M. D.

Physical Therapy in Fracture Treatment

Frederic Jay Cotton, M. D., F. A. C. S., and Thomas Howard Peterson, M. D., Boston, Mass., in J. Bone & Joint Surg., XVI:3:658, July, 1934.

Physical therapy should have, as it has not had in the past, a very important role in the treatment of injuries, particularly fractures.

That it has not played such a role is in part due to ignorance or indolence on the part of the surgeon, in part to extravagant and illogical claims as to what can be accomplished.

In fact, unfortunatly, one commonly hears all physical therapy for fractures condemned, and swept aside by the surgeons into one waste basket with the much abused "B. & M."—baking and massage.

Passive exercises, with or without stretching, used from time immemorial, are really of very limited value, but have only lately been supplanted, and only in part at that, by active exercises, which form far and away the most important item in fracture treatment by physical therapy.

This includes, of course, both ordinary active movements and movements in which the weight of the limb is supported by the hand of the operator or in a supporting medium, be it water or the paraffin bath. There is a definite distinction between active supported exercise and non-supported exercise of the usual type.

Heat, obviously comforting, has unquestioned value, but is less important than is believed, in treatment of injuries at least. Its main function is in preparation for exercises, and its action is pleasantly sedative to pain, sedative to spasm, stimulating in the sense of promoting some hyperaemia. It is applied in many ways.

Static electricity has probably no more value than that of pleasant titillation, and the effect of the technical scenery of the surroundings.

The galvanic current has testing value, is not reliably available for muscle work, and has not been shown of use in promoting absorption or repair.

Faradic current direct may be disposed of in the same phrase.

Interrupted sinusoidal currents have value particularly for muscle stimulation—sometimes very important.

Diathermy, much discussed, is the method by which opposed interrupted high frequency currents are so applied that at their meeting point they develop heat within the body, and within a limited area more or less accurately determined.

The fact that the heat so generated is of electrical origin is a matter of concern only in relation to skin contacts. Diathermy is not a form of electrical treatment at all, but the application of heat.

As to what is actually done in generation of heat in the body, many extravagant claims have been made in forgetfulness of the fact that the internal cooking of a steak concerns dead tissue, and is in no way comparable to the heating of tissue surrounded and permeated by a rapidly circulating blood stream.

Actually, however, heat is developed and may be made use of, with due caution, to produce vessel dilatation and local hyperaemia. Diathermy seems to promote bone repair in this way to some small extent, and has a place in fracture treatment in selected cases.

Heat and gentle massage are combined in the whirlpool bath, with the air intake of the Hutchins or Titus machines. Useful—decidedly not indispensable.

The installation of elaborate plants is probably nowhere needed, certainly not for fracture treatment. A diathermy outfit is needed, perhaps a Smart machine. Nothing else is important except a baker of some sort.

The physical therapy treatment of fractures should be, very definitely, not a matter of machines or apparatus.

What we want to do is to secure repair with the least possible interruption of function.

Complete recovery of function depends on early resumption of function to a great degree.

Restoration of normal circulation means not only active repair, but also the removal of excess exudate, resulting in less excessive deep-scar formation—less fibrosis of muscle and ligament.

Restoration of muscle activity means preservation of muscle nutrition—function of joints.

If we have a fresh fracture, the first therapy, if there is effusion into the tissues, is massage, to cause rapid absorption of blood and lymph under direct manipulation until nearly normal conditions are restored. Then comes the reduction and fixation.

Fixation we cannot sacrifice, but apparatus may very often be devised to give opportunity for early massage without sacrificing security, or plaster casings often may safely be cut to allow this handling, with early motion of joints not intimately involved in the immobilization of the fracture.

Such massage must be gentle, persistent.

And so we come to the later convalescent stage. This should be the stage of real recovery of function after weeks of careful physical therapy.

Actually, too often, it is the stage when stiff limbs are handed over for the physical therapist to begin on. And that is the main trouble; for by that time the patient has had his fracture; he has stiff joints not under control; he has stiff muscles and has no power to use them; he has a mind already grown clogged, or with the wires down between it and his muscles, and effort hurts him. So he is baked and likes it—and of this no end.

Heat and massage are well enough if we realize—and make the patient realize—that they are of use only as preparation for the active exercise and use which is his only salvation.

The physical therapist is of vast use in two ways:

1. In devising exercises that are easy, utilizing gravity instead of fighting it—exercises that the patient can learn to do with precision, exercises that risk neither loosening of a recent union, nor overtiring of muscles.

2. In making him do them, at home as well as in the office. In making him work, himself.

Sources of Ultraviolet and Infra-Red Radiation Used in Therapy

Physical Characteristics

W. W. Coblentz, Ph.D., D.Sc., Washington, D. C., in J. A. M. A., 103:3:183, July 21, 1934.

1. Depth of Penetration of Thermal Radiation.—Authorities differ as to the depth of penetration of radiation of different wave lengths into the human body.

Different Spectral Regions, Probable Depth of Penetration and Probable Physiologic Action of Rays from Different Sources:

Spectral Region	Penetration of Rays	Physiologic Action	Source
Far ultraviolet 1,800 to 2,900 A	Superficial 0.1 to 0.5 mm.	Photochemical	Metals carbon arc and spark of metals (mercury arc)
Near ultraviolet 2,900 to 3,650 A	Superficial 0.5 to 1 mm.	Photochemical	Sun; metals in carbon arc; arc of metals
Visible spectrum 3,900 to 7,600 A	Superficial 1 to 5 mm.	Thermal; nerve stimulation	Sun; carbon arc
Near infra-red 7,600 to 15,000 A	Deep 10 to 30 mm.	Thermal; nerve stimulation	Sun; carbon arc; gas-filled tungsten lamp
Far infra-red 15,000 to 150,000 A	Superficial 3 to 0.1 mm.	Thermal; nerve stimulation	Carbon arc; infra-red (radiant) heaters

2. Reflectors and windows.—In view of the fact that most lamps used for therapeutic purposes are provided with reflectors and windows, it is relevant to emphasize the fact that the mirror acts solely as a reflector of the rays that fall on it and does not itself contribute anything additional to the ultraviolet radiation emitted by the source. In fact, since the reflector absorbs more of the short wavelength ultraviolet than of the visible and infra-red rays, especially when the surface is composed of a powdered metal (for example, aluminum) which has been applied with a lacquer, the total amount of ultraviolet radiation in proportion to the visible and the infra-red rays is relatively lower in the reflected rays than in those that proceed directly from the source.

3. Radiant heat versus conducted heat.—Owing to the general misconceptions on this subject, it is relevant to call attention to the difference in heat transfer by conduction and by radiation. Practically all the heat obtained from an electrically operated heating pad or a hot water bottle (which takes the place of a heated brick or of ground meal used in the earlier days), placed in contact with the body, is transferred by thermal conduction. The amount obtained in the form of intra-red rays is negligibly small.

Sources of Radiation

1. Miscellaneous sources.—Under this caption may be grouped vacuum incandescent lamps, kerosene lamps, acetylene flames, luminous and Bunsen gas flames, and incandescent mantles heated by gas flames, which do not emit sufficient ultraviolet radiation to be useful in therapy. Neither is the ultraviolet emitted of sufficient intensity to be a source of injury to the eye.

2. Infra-red radiators.—Under this caption may be placed various radiant heaters used for therapeutic purposes. They consist of a concave reflector at the focus of which is an incandescent filament lamp in a glass bulb, or a heater consisting of an electrically heated solid rod, or a resistance wire embedded in or wound on an electrically nonconducting, refractory material, much as, for example, steatite, "lava" or porcelain. The color of the surface (whether white or black) is unimportant. The nonmetallic surface emits the greatest amount of infra-red rays.

3. The tungsten filament lamp.—The "mazda" tungsten filament lamp, enclosed in a bulb of special glass that transmits ultraviolet at wavelengths extending from 2,800 to 3,100 angstroms (recognized as effective in preventing rickets) has been considered for a source of ultraviolet radiation.

Calculations and radiometric measurements show that the tungsten filament lamp, even when enclosed in a bulb that transmits the ultraviolet rays extending from 2,800 to 3,100 angstroms, emits but little ultraviolet radiation of these wavelengths.

4. The violet ray lamp.—One of the standard products of commerce is an incandescent lamp consisting of a helical carbon filament in a bulb of blue glass, sold for decorative purposes and sources of low illumination in assembly rooms. If such lamps have a therapeutic effect, e.g., in stimulating the growth of hair or bald heads, it should be noticeable on patrons of amusement houses. Nevertheless such lamps have been put into special caps and sold for growing hair and for therapeutic purposes.

5. The nickel and the tungsten arc.—The radiation emitted from the arc vapors between two electrodes of nickel, and of tungsten, consists of numerous fine lines which are not separated when examined with a small spectroscope.

6. The sun.—The intensity of the ultraviolet rays varies greatly with the altitude above sea level and also with the time of day. Only between the hours of 9 a. m. and 3 p. m. (excepting in the three summer months, when least needed) is this ultraviolet component of sufficient amount to be of importance radiometrically, and probably therapeutically. In addition to this variation with the time of day, the amount of vitalizing ultraviolet solar rays available for therapeutic purposes varies with the season of the year, with the altitude and the geographic latitude of the station, and with the almost infinite variety of air pollution and weather conditions that are encountered in different localities.

7. The carbon arc.—The carbon arc is the hottest artificial source of radiation readily obtainable, and in this respect it is the closest approach to sunlight. However, the radiation from the carbon arc is far from being like sunlight.

Hence no exact comparison can be made between the radiation from the sun and the carbon arc.

The crater of the positive electrode emits an intense white light, which, as already mentioned, is mixed with the radiation of the arc vapors. This fact is usually overlooked in discussions of the radiation from the carbon arc. The vapors from the pure carbon arc contribute but a small amount to the total radiation emitted.

No appreciable radiation of the sun of wavelengths less than 2,900 angstroms is transmitted by the earth's atmosphere. On the other hand, radiation of wavelengths out to 2,200 angstroms is observable in the white flame carbon arc. On the other hand, under the same conditions, the radiation of the sun in the visible spectrum is relatively far more intense than that which obtains in the white flame carbon.

Factors affecting carbon arc radiation: It has been found that the radiation from the carbon arc depends on (1) the size and the kind of the electrodes (white flame, blue flame, red flame, chart 4); (2) the direction of the current when direct current is used through combinations of neutral cored and impregnated carbons; and (3) the amount of electric current.

Therapy of Rheumatic Fever

Edited by Bernard Fantus, M. D., Chicago, in J. A. M. A., 102:25:2100, June 23, 1934.

Prophylaxis

1. The patient's resistance should be increased by:

(a) A nutritious diet, including an abundance of vitamins.
(b) The administration of cod liver oil.
(c) An outdoor life.
(d) Graduated tonic cold hydrotherapy.

2. Chilling, especially when fatigued, should be avoided by:
(a) Warm clothing (but not to the extent of sweating).
(b) Avoidance of prolonged exposure to cold and wet. Wet garments, especially shoes and stockings, should be changed at the earliest possible moment.
(c) One should change to a warm climate. Rheumatic fever does not occur in the tropics.

3. Adequate treatment of the primary infection should be given by:
(a) Keeping the patient in a warm room if mild symptoms of a cold are present.
(b) Absolute rest in bed, if there is a fever, and for as many days of normal temperature as there has been temperature abnormality.
(c) Isolation of cases of catarrhal fever, or enforced absence from school on the part of children so infected.

4. Removal of foci of infection in:
(a) The tonsils: frequently repeated tonsillitis is an indication for tonsillectomy; or whenever rheumatic fever, chorea or carditis follows tonsillitis, provided there is evidence of infection in the tonsils.
(b) Abscessed teeth.
(c) Other tissues.

Treatment

1. Absolute rest in bed should be insisted on.
2. Chilling should be avoided.
3. Analgesics to be employed.
4. Resistance should be increased.
(a) Alkalis (prescription 6) in sufficient dosage to render the urine alkaline are probably of value in antagonizing the tendency to acidosis, which is believed to lessen resistance.
(b) Protein shock therapy.
5. Local therapy includes:
(a) Absolute rest to the affected joint by pillows, sandbags or light, easily removable splints (not plaster of paris).
(b) Warmth, e.g., wrapping of the affected joints in cotton pads one inch thick, two or three feet long and covering one and one-half times the circumference of the joint, the cotton being placed between layers of gauze and tied on with tapes.
(c) Compresses of hot half-saturated solution of magnesium sulphate.
(d) Rubefaction by means of methyl salicylate (which may be diluted with oil for tender skins) painted on two or three times daily and covered with a cotton bandage.
(e) Blisters (prescription 7) against obstinate pain and tenderness.
(f) Aspiration of joints tensely distended with fluid.

Relapses may be prevented by the measures described for prophylaxis. Tonsillectomy is to be considered, but not until the patient has completely recovered, and then only if the tonsils are definitely diseased.

Diathermy and Regeneration of Bone

Abst. in Jour. A. M. A., 103:4:294, July 28, 1934. Arch. Surg. Chicago, 28:1121 (June), 1934.

Weinberg and Ward endeavored to determine whether there is an actual rise in temperature in bone when an extremity of an experimental animal is submitted to treatments with diathermy; if there is a rise in the temperature of bone, whether this results in any demonstrable physiologic effect on bone in normal laboratory animals, and whether this physiologic effect, if present, hastens repair processes following injury to the bone. During postoperative treatment with diathermy, bleeding from the open wound was found to be due to the treatment. There was a free flow of blood shortly after the turning on of the current, but the bleeding stopped as soon as the heat was discontinued and the leg allowed to cool a little. As soon as hot electrodes touched the leg of the animal a rapid rise in temperature occurred in both the muscle and the bone, demonstrating that with such a small part of the body as the dog's forelegs external heat will also raise the temperature of the bone. This seems to indicate that in these animals, at least, therapeutic effects may be obtained by the external application of hot objects. The rise in temperature of the muscles and that of the bones are nearly parallel. The temperature of the muscles rises a little faster at first, to be overtaken later by the temperature of the bones, which, near the end of the experiment, again falls. In one week microscopic changes in the treated leg, in which the hole was filled with vascularized connective tissue, a few degenerated red blood cells and a small amount of bone dust, showed formation of new bone arising from the cut edges of the compacta. In three weeks there was a decided advance in the periosteal and endosteal formation of new bone, and in four weeks the treated leg revealed marked new periosteal bone. In four weeks in the control leg there was little or no periosteal new bone, and the hole was filled with a lamellar type of bone, so that it was not yet healed.

Sources of Ultraviolet and Infrared Radiation Used in Therapy

Physical Characteristics

W. W. Coblentz, Ph.D., D.Sc., Washington, D. C., in J. A. M. A., 103:4:254, July 28, 1934.

The hot quartz lamp: The earliest and best known type of quartz mercury arc lamp (the so-called hot quartz lamp) operates at a high vapor pressure and a relatively high temperature. The current through the lamp is fairly large (from 3 to 4 amperes) and the voltage on the burner is low (from 65 to 70 volts).

Investigations of quartz mercury arc lamps having (1) a solid tungsten anode and (2) a liquid mercury anode show that there is no appreciable difference in the ultraviolet component radiation emitted by these two types of lamps when operated on the same energy input in the burner.

The mazda sunlight lamps: A recent production (the mazda S-1 and the mazda S-2 "sunlight" lamps) is a combination of an incandescent tungsten filament and an arc in mercury vapor between highly incandescent electrodes of tungsten. This is accomplished by operating a V-shaped helical tungsten filament in parallel with the mercury arc, but it is at a considerably lower temperature than the incandescent tungsten electrodes forming the arc at the top of the V-shaped filament.

The "cold quartz" lamp: The so-called cold quartz

ultraviolet lamp is essentially a low vapor pressure, low amperage (0.015 ampere), high potential (5,000 volts, open circuit), glow discharge, similar to the well known Geissler tube. The power consumed is small and consequently there is no great rise in temperature of the burner.

The high frequency electrodes discharge: The most recent production in ultraviolet therapeutic lamps in the electrodeless discharge, through mercury vapor, in a quartz bulb. The lamps examined were spherical bulbs of quartz, or Corex-D, glass (without electrodes), which are placed within a helical conductor that carries the high frequency current, obtained from the transformer of a diathermy machine. The bulb is evacuated and contains a globule of mercury, the vapor of which is excited to luminescence by means of the high frequency discharge, from the 5,000 volt secondary of the transformer, passing through the helix surrounding the bulb. It is well known that the emission spectrum of the electrodeless discharge is essentially that of the neutral mercury atom, similar to that of the ordinary mercury arc; though close to the walls of the bulb there are some weak spark lines, not present in the hot quartz mercury arc lamp.

The cold red light: But few sources of radiation remain unexploited for therapeutic purposes. A recent European production is the so-called cold red light emitted by the neon glow discharge tube, familiar to all in the form of the sign-lighting tubes in show windows and street signs. Neon emits practically no radiation of wavelengths longer than about 10,000 angstroms. From the clinical tests made by Cramer and Fechner with a neon glow lamp, made for therapeutic purposes, it appears that the cold red ray lamp has little, if any, specific stimulating effect on the human body.

The Council specifications of minimum intensity are based on a comfortable and convenient operating distance (24 inches, or 61 cm.) from the front edge of the reflector, at which distance the exposure can be made without burning the skin by coming in contact with the burner or by the infra-red rays. The ultraviolet intensity of the lamp shall be such that the time of exposure to produce a minimum perceptible erythema (one that disappears in less than twenty-four hours) will not be longer than fifteen minutes for a therapeutic lamp and sixty minutes for so-called sunlamps.

Conclusions

It may be stated that in general the lamps submitted to the Council have an intensity that is several times the minimum requirements tabulated. The operating distance and the time of exposure to a given type of lamp are specified by the manufacturer.

In the newer lamps, such as the G-type glow lamp, the first productions did not comply with the specifications, but these lamps were promptly improved to meet competition with other types.

In general, the specifications by the Council have tended to improve the output of responsible lamp manufacturers, but at present there seems to be no means to prevent the exploitation of the public by the sale of cheap lamps emitting little or no ultraviolet radiation.

Certain Bases of Physical Therapy

By Thomas P. Sprunt, M. D.; F. A. C. P., Baltimore, Maryland in Ann. Inst. Med., 8:2:192, August, 1934.

During the past year it has fallen to my lot to become particularly interested in physical therapy. What I shall have to say is addressed not to expert physical therapists but to practicing physicians who, like myself, have had heretofore but a desultory interest in the subject and while not decrying the value of empiricism in therapeutic methods, would still wish to know something of the underlying physiological factors that may have been determined.

Although physical therapy may have been over-exploited here and there during the past several years, one gets the impression that it is much more widely neglected to the great detriment of many patients who are badly in need of it. The Council on Physical Therapy of the American Medical Association is doing a valuable work in disseminating useful information on this subject and in protecting the profession against misleading and deceptive advertising. They have wisely emphasized the point that among the physical methods of treatment the fundamentals are massage, active and passive exercise, muscle training exercises and the application of heat. As a corollary to this statement one may add that a well trained, skilful technician, intelligently directed, is of more value than much costly apparatus.

The skin is not merely an integument, a covering for the body, but a complex tissue with many functions. Let us pass some of them in review. First, there is the integument, a physical barrier to the outside world. Second, the sebaceous glands. Third, the blood vessels with their remarkable reactions in maintaining and regulating body temperature and in defense against injury. Fourth, the lymph vessels. Fifth, the sweat glands with their service in temperature regulation and in excretion. Sixth, the function of insensible perspiration, also of value in temperature regulation. Seventh, the nerves and nerve endings, the sources of sensory impressions and of reflex activities. Eighth, other metabolic or chemical factors under which we may mention (a) resorption, a factor of little importance in the human skin, (b) pigment formation, (c) the histamine-like substance postulated by Lewis, (d) ergosterol, which is changed by ultraviolet irradiation to viosterol, with the production of vitamin D, (e) the high potential of tissue immunity emphasized by Kahn who finds that the skin possesses a specific reacting capacity for antigens more than ten times as great as the reaction capacities of muscle, of brain, or of plasma.

The skin then is a complex structure capable of a variety of reactions to stimuli both from without and from within. The vascular mechanisms are particularly intriguing and have been studied by many physiologists, including Sir Thomas Lewis, who found that numerous and widely different forms of stimulation yield in common three distinct events; these are (a) a primary and local dilation of the minute vessels of the skin, (b) a widespread dilatation of the neighboring strong arterioles brought about entirely through a local nervous reflex, and (c) locally increased, permeability of the vessel wall. In explanation of this complex mechanism he postulates the release of a histamine-like substance and considers it a normal metabolite that is responsible for many of the normal vascular reactions as well as those occurring under conditions of stress. In the light of such researches it seems entirely probable that many of the reactions of the skin and other tissues to physical therapeutic procedures are really defense reactions on the part of tissues to outside agencies and are non-specific as far as the particular therapeutic method is concerned. There are of course specific responses as illustrated by the difference in the skin reactions to heat rays and to ultraviolet rays, and by the striking difference in reflex activities following the applications of cold and of heat. All

these responses, specific and non-specific, may be considered defense mechanisms and whenever the defense reaction is favorable to the condition under treatment, the therapeutic method is useful.

The effect of heat on the circulation: This very important effect of heat is exerted both directly upon the vessel walls and reflexly through the vasomotor nerves. Heat produces vasodilatation and cold, vasoconstriction. Not only is the effect a local one but through the reflex activities distant parts of the vascular tree may be affected as has been demonstrated definitely by Lewis and others.

There are marked variations in the blood flow as the result of heat or of cold. The local circulatory rate in the arm in an arm bath has been measured and recorded. At 32° C. (approximately the normal temperature) the flow of blood was 13 c.c. per 100 c.c. of tissue per minute. At 26° C. the flow was 5.5 c.c. of blood per 100 c.c. of tissue per minute. At 46° C. the flow was 26 c.c. of blood per 100 c.c. of tissue per minute.

Heat also produces a marked increase in the transudation of fluid from the blood vessels and hence in the formation of lymph. When these vascular changes are widespread as in a warm bath, for example, there occur definite readjustments in the fluid balance with increased formation of lymph in the skin and subcutaneous tissues but, in the splanchnic area vasoconstriction, diminished capillary tension and increased absorption of water. Similarly, cold applications to the skin may result in vasodilatation of internal vascular beds and a consequent diuresis.

Effects of heat on the blood: When the blood is heated locally there are marked changes in its physical chemistry with a shift toward the acid side as is illustrated in the following experimental record. The blood was obtained from an arm vein after the arm had been placed in a water bath at the different temperatures. At 33° C. (91.4° F.) pH 7.45; POH 6.3; CO_2 tension 35 mm.; O_2 saturation 70 to 90 per cent; O_2 tension 45 to 55 mm. At 40° C. (104° F.) pH 7.3 to 7.4; pOH 6.2; CO_2 tension 45 mm.; O_2 saturation 90 per cent +; O_2 tension 70 to 95 mm.

The effect of heat on metabolism: The metabolism of the tissues is definitely increased by heat. As tested upon an isolated organ, as in the perfused heart, it is estimated that the metabolism increased two or three times with a rise of 10° C.

There is an interesting experiment in the study of cyanosis in the forearm produced by stasis due to a constricting band on the upper arm. In a water bath at 31° C. (87.8° F.) cyanosis was obvious in three minutes; at 42° C. (107.6° F.) cyanosis occurred in one minute; at 15° C. (59° F.) no cyanosis occurred in 15 minutes. From this experiment it is obvious that the usage of oxygen was markedly affected by the changes in temperature.

Hitherto we have been dealing with the local application of heat. As you well know, by more general heat applications or by the prevention of heat loss, a rise in the general body temperature can be induced. The complex changes that are brought about by elevating the body temperature may be summarized as follows: Increased circulatory rate, rise in blood volume, marked increase in the ventilation rate, fall in alveolar CO_2 tension, rise in oxygen consumption, increased metabolism, and changes in the pH of the blood and urine to the alkaline side. Clinical work indicates a definite change of tone in the autonomic nervous system.

What Can the General Practitioner Expect from Infra-Red Therapy

Council on Physical Therapy in: J. A. M. A., 103:1:27, July 7, 1934.

In this article, only the use of local radiant heat will be considered. The therapeutic indications for the use of heat locally are chiefly in the following fields: surgery, following fractures, dislocations, sprains, cicatrices after operating procedures, arthritis when a limited influence on the joints is desired, myositis, neuritis, and circulatory disturbances of the extremities.

Local application of heat in arthritis: The application of heat locally to a joint or joints in arthritis is often of the highest therapeutic value. The principle holds, here as elsewhere, that reliance must not be placed on this measure alone. It must be considered in conjunction with other principles of treatment of the disease as a whole and of the joint in particular. The measure most often used in arthritis in conjunction with local external heat is massage and although often misused it constitutes an almost necessary adjunct to the use of heat alone, especially in the form of stroking massage.

Neuritis and neuralgia: Heat is of the greatest value in inflammations of the peripheral nerves and in vascular diseases in which the nervous system is implicated. In the various neuritides, such as intercostal neuralgia or inflammation of any of the nerves in the limbs, heat, and particularly radiant heat, allays the inflammation.

Circulatory disturbances of the extremities: Starr reported that at temperatures under 30 C. (86 F.) the feet showed varying degrees of cyanosis and the patients complained of pain. Between 33 and 35 C. (91.4 and 95 F.), pain diminished or disappeared and the color of the feet most closely approached the normal. Above 35 C. (95 F.), cyanosis reappeared and pain returned.

A temperature of between 30 and 35 C. (86 and 95 F.) was employed in the treatment of these conditions, maintained around the feet day and night by means of a thermoregulated foot cradle. Under such conditions some patients preferred temperatures differing slightly from that which they chose in the acute experiment, so temperatures between 32 and 37.5 C. (89.6 and 99 F.) have been used for prolonged treatment.

Chronic diseases of the nervous system: In hemiplegia or lateral sclerosis, when the limbs are spastic, radiant heat will decrease the spasms and contractures, at least for a time, and will moderate other symptoms.

Fractures: But fractures into or about the joints, such as Colles' fracture or Pott's fracture, accompanied by swelling at the site of the fracture and particularly by swelling of the hand or foot, are best treated by radiant heat followed by massage. This treatment should be begun within a few days after reduction of the fracture.

Sprains and dislocations: Treatment is similar to that of fractures near joints as just described. Splints or casts should be removed and replaced again after daily treatment by heat application and massage. On the whole, fixation of a removable plaster splint and daily radiant heat and massage treatments are to be preferred to strapping with adhesive plaster, which does not permit the use of physical therapy.

Traumatic synovitis and tenosynovitis: After the first stage of acute inflammation lasting from one day to possibly a week, the secondary stage of absorption of effusion and restoration of function of the joint begins.

Contusions and muscle sprains: Similar means of

treatment are valuable also in these conditions to secure absorption of the products of hemorrhage, to eliminate swelling and pain, and to secure restoration of function.

Stiff joints: Even in fairly severe cases of fibrous, ankylosis, some benefit is to be obtained by using radiant heat followed by massage, stretching and exercise, while in the milder cases even complete restoration of function in the joint may be expected.

In the condition of flatfoot due to traumatism or possibly to infection, semirigid and spastic feet can frequently be made more flexible by these means of physical therapy in conjunction with the use of proper supports for the feet.

Chronic backache can be profitably treated by radiant heat and massage, by proper means of support for the muscles and ligaments that are under strain, and by properly graded exercise to improve posture.

The Management of Unconscious Patients with Special Reference to Posture in the Treatment

C. C. Coleman, M. D., Richmond, Va. (Department of Neurological Surgery, Medical College of Virginia). In Virginia Med. Mo., 61:5:270, August, 1934.

The main purpose of this discussion of the general management of the unconscious patient is to call attention to some of the disadvantages of the posture ordinarily used and to emphasize the benefits of the head-down position of the patient when edema of the lungs or other pulmonary complications appear to be developing. The favored posture of the unconscious patient, particularly after operations upon the brain or when unconsciousness is due to head injury with or without operation, has been almost universally one of elevation of the head and upper part of the body of the patient. This position has been maintained except in shock, in almost all cases on the theory that the head elevated position tends to prevent pulmonary congestion and edema—always a danger in prolonged unconsciousness. We have much to learn as to the connection between serious cerebral impairment, whether due to disease or to injury, and the development of lung complications. We are inclined to believe that edema of the lungs is often a direct cerebral complication, and, while favored by an improper position of the patient, may nevertheless develop in spite of any posture that may be employed. In the treatment of unconscious patients we invariably lower the head in shock, and after the period of shock is passed, they are usually put in the head-elevated position, provided there are no signs of pulmonary complications. Should these develop, we have, during the past eighteen months, elevated the foot of the bed from five to twenty degrees, turning the patient upon his side almost face downward and removed the secretions from the pharynx by a suction apparatus. This reversal of the orthodox, head-elevated posture in these cases, has appeared to bring about results that are very remarkable. In favorable cases the temperature falls, coma to deep unconsciousness lightens and symptoms of lung involvement disappear in a few hours, the respiratory rate slows and the whole clinical picture changes rapidly for the better. It has been a matter of surprise in some of these patients to note the large amount of secretions which may be removed from the pharynx after elevation of the foot of the bed. The reason for the standard, head-elevated position in the treatment of unconscious patients, is the tendency of this position to lessen cerebral complications, to diminish intracranial hemorrhage following operation, or in cases in which there has been a spontaneous rupture of a blood vessel. Undoubtedly it is true that these benefits of the head-elevated position may be expected as long as the patient's pathology is limited to the brain. The development, however, of pulmonary complications with obstruction of the tidal air by accumulated bronchial secretions, more than offsets the benefits which would otherwise accrue from the head-up posture, and favors cyanosis which raises intracranial pressure, thus adding to the patient's difficulties. Raising the foot of the patient's bed does to a limited degree impede the action of the diaphragm and causes a certain amount of pulmonary congestion. These objections, however, are more than compensated for by the drainage from the chest which the lowering of the patient's head promotes. An obvious contraindication to a head-down position could be cardiac decompensation, asthma, and perhaps other conditions in which the patient might do better with head elevated.

Summary

The treatment of the patient unconscious from any cause, should receive special attention directed to nutrition, fluid intake and posture.

The patient's inability to cooperate should be offset as far as possible, to his advantage, by a more watchful care and keen observation on the part of his physician.

In the treatment of patients with cranio-cerebral lesions, elevation of the head has generally been the accepted posture. Raising the head of the patient lowers intracranial pressure and tends to prevent, or minimize intracranial bleeding. In unconscious patients, however, or those with difficulties of deglutition, the head-elevated position may favor pulmonary complications. In this type of patient, lung infections may often be avoided by sharply lowering the head of the patient, keeping the patient on his side, and removing bronchial or oral secretions by suction. Great improvement in the writer's results in such cases has been brought about by change from the head-elevated to the head-lowered position in cases following brain tumor operations, severe head trauma and apoplexy. In the absence of cardiac decompensation, the head-down position with the patient on his side may give good results in unconsciousness from many causes other than those stated above.

The Therapy of the Cook County Hospital

Edited by Bernard Fantus, M. D., Chicago, in J. A. M. A., 103:3:183, July 21, 1934.

Therapy of Erysipelas

Prophylaxis

1. Isolation from surgical patients is desirable and from obstetrics patients is imperative, but quarantine otherwise is not required.

2. Disinfection of the hands and of the instruments of physicians and of nurses taking care of a patient with erysipelas is necessary.

3. The organism may persist in the patient for a long time in sinus or nasal discharges, which accounts for the tendency to recurrence in those who have suffered from the disease.

Treatment

1. Local.—(a) Ultraviolet irradiation of the area involved and of the normal adjacent skin at least two inches beyond the border should be done. The mercury quartz burner is used. Usually one intense treatment suffices.

(b) Roentgen rays, 100 kilovolts, unfiltered, in moderated doses (not over one-fourth erythema dose) should be applied and the application repeated not more than one on the second day, if results have not been satisfactory.

(c) A barrier consisting of a narrow (three-fourths inch) band of contractile collodion (Collodion, U.S.P.) all round a small lesion may possibly be effective.

(d) Evaporating lotions, applied ice cold by means of uncovered compresses, give relief to the hot burning sensation, which may be still better ameliorated by the addition of 1 per cent phenol.

2. Erysipelas antiserum.—Administration of erysipelas antiserum should be preceded by an intracutaneous test of 0.1 cc. of the serum diluted 1:10. If the test is negative within fifteen minutes, one may inject the remainder of the contents of the ampule. The dose may be repeated daily for three days.

3. Fever regimen (q. v.).—Restraint is not infrequently necessary, as acute delirium may supervene.

4. Symptomatic treatment.—A hypnotic may be required for obstinate insomnia (q. v.) or stimulation for collapse (q. v.).

Hypertrophic Arthritis of the Hip
A Review of Seventy-Nine Patients

John G. Kuhns, M. D., in New Equipment J. M., 210:23: 1213, June 7, 1934.

The treatment of these patients was wholly conservative, not from lack of competent surgical assistance or from extreme conservatism, but as an attempt to determine what would be the result with as good a regimen of health as could be devised at that time. The earlier cases from 1914 to 1920 were treated with rest, a little physical therapy and local support to the hip, usually a plaster or a leather spica. The results in these early cases were not particularly good. They compare in functional rehabilitation and in relief of pain about equally well with the results of the various surgical procedures which were performed for hypertrophic arthritis, of which reports appeared in the literature during these years. From about 1920 onward came a fuller realization that one was not dealing with a localized disease in the hip alone and the results of treatment improved tremendously with prolonged and adequate rest, physical therapy devised to correct so far as possible the mechanical inadequacies of the affected hip joints, including general postural exercises and local measures to increase motion and strengthen muscles about the hip itself, and whatever measures were indicated to improve the general health.

It has long been known that constant rest in a position in which there is no strain will usually relieve the muscle spasm and pain in hypertrophic arthritis quite promptly. In the later cases the patients were kept in bed for a prolonged period of time, usually two weeks or longer, and the affected hip joint was kept in a position which least resisted the muscle spasm either by pillows and sandbags or with a plaster spica. Walking was not permitted until muscle spasm was almost gone. Heat was used locally to improve the circulation about the hip and to produce muscular relaxation. Massage was used in only a few of the cases since nutrition and strength seemed to improve much more rapidly with supervised active use of the muscles than by the passive stimulation given by massage. The physical therapy given was not primarily for local comfort but rather to correct the mechanical deficiencies of the body which resulted in strain and acted as aggravating factors in the hypertrophic arthritis. One of the chief factors found in association with poor posture was the markedly increased forward inclination of the pelvis. This, by increasing the lumbar lordosis and changing the pull of the flexor and extensor groups of muscles about the hip joint, decreased its stability and made strain a more constant factor. The thrust of weight and the carriage of the upper part of the body as well as any foot strain were also corrected.

The medical treatment and the general upbuilding measures varied with the individual patient. In all an attempt was made to give a diet adequate in mineral constituents and vitamins, high enough in calories for the individual need, usually low in calories for the obese patients and moderately low in carbohydrates for all. Laxatives were used at first in most of the cases to secure more accurate intestinal elimination. In a few patients where intermittent swelling and pain occurred in various joints where hypertrophic arthritis of the hip was present, in the presence of a slight persistent increase in temperature and an increased blood sedimentation rate, vaccines were used usually after testing for skin reactions. There was appreciable clinical improvement in a small number of these patients after the use of vaccine.

Conclusion

Hypertrophic arthritis of the hip was not found as a disease of the hip alone; other articulations and tissues showed changes on more complete examination. A study of the histories of the patients in this series suggested the interaction of both local and systemic etiologic factors, usch as trauma, faulty posture, disordered intestinal function, infections and endocrine disturbances. Data of the end results showed that progressive deterioration was not necessarily the usual course, even in the aged, when therapy and supervision were continued for a long period of time. Treatment which changed steadily with the increase in our knowledge of this condition was able to relieve the pain and disability in the majority of these patients.

The Work of the Council on Physical Therapy of the American Medical Association

John S. Coulter, M. D., and Howard A. Carter, B. S., in M. E., Chicago, Illinois; in New York State J. M., 34:15:689, August 1, 1934.

The aims of the Council are:

(1) To protect the profession and the public from misleading and deceptive advertising in connection with the manufacture and sales of physical therapy devices;

(2) To disseminate such reliable information as the Council may possess or acquire in the use of physical therapy;

(3) To stimulate instruction designed to aid the practicing physician in the choice and application of sound methods of physical therapy;

(4) To act in an advisory capacity to the profession and the public in matters pertaining to this particular field of therapy.

How are these aims accomplished? To protect the profession and the public from misleading and deceptive advertising in connection with the manufacture and sale of physical therapy devices, it has been necessary to devote much of the time of the Council to the consideration of physical therapy apparatus, including that which has been submitted by manufacturers with a view of securing the Council's acceptance, and that which is offered for sale without submission. The list of accepted and rejected apparatus is proof of the earnest effort that has been made to properly evaluate the evidence that has been submitted to the Council, to safeguard the interests of reputable manufacturers and to protect the medical profession and the public.

The Council has on file lists of accepted apparatus. It can now be stated that the medical profession and hospitals should buy only high frequency electrical machines and ultra-violet lamps that have been accepted by the Council, as these are the only machines that have been thoroughly examined for safety and efficiency by a disinterested group. There are a large number of devices that might be regarded as coming within the purview of the Council. However, to facilitate the work of the Council, two lists of devices have been formulated: one a list of apparatus that the Council will consider and report on as soon as possible, and the other a list of articles that cannot be given immediate attention.

The second aim of the Council is to disseminate such reliable information as it may possess or acquire on the use of physical therapy. The most important step in this aim was the publication of the Handbook on Physical Therapy, in which many valuable and authoritative articles previously published in the Journal of the American Medical Association were brought together.

The third aim of the Council is to stimulate instruction designed to aid the practicing physician in the choice and application of sound methods in physical therapy. This must start in premedical education. Early the Council realized this and published an article on this subject in 1926.

The Council has published articles on "Medical Education" in 1930 and 1931 and will soon publish another on "The Teaching of Physical Therapy to Undergraduate Medical Students."

The final aim of the Council is to act in an advisory capacity to the profession and the public in matters pertaining to physical therapy. This is done largely through correspondence and the success of this effort is demonstrated by the gradual increase of correspondence of the Council.

Balneotherapy in Circulatory Disorders

Walter S. McClellan, M. D., From the Medical Department of the State Reservation, Saratoga Springs, New York, in Arch. Physical Therapy, XV:6:366, June, 1934.

An understanding of the physiology of the skin, of the circulation, especially the peripheral capillaries, and of the autonomic nervous system, is important in the interpretation of the results obtained from carbonated baths. These results depend on the condition and the reaction of the patient to certain influences of the bath. In evaluating the condition of the patient, one must consider, first the severity of the circulatory disorder present and, second, the mental reaction to the course of treatment. In estimating the influence of the bath, one must consider three major factors,—the thermal, the mechanical, and the chemical effects. The thermal effects depend on the temperature of the water. Here the old principle that heat expands and cold contracts comes into play. A warm bath will aid in producing relaxation while one which feels cool may cause stimulation. With the average individual, this temperature usually falls between 90 and 95 degrees F. for the naturally carbonated water. This is 2 to 5 degrees cooler than the neutral tempetrature of plain water. The mechanical influences of the bath depend on the pressure exerted on the outer surface of the body. This pressure increases directly with the amount of saline constituents in the water. The chemical stimulation depends on the substances which are present in the bath, of which the saline constituents and the carbon dioxid must be considered.

Effect of Treatment

In 88 patients who were studied during the past season for changes in pulse rate and blood pressure, no marked change occurred as 60 per cent of the group did not vary more more than 5 beats per minute when the resting pulse at the end of the series of baths was compared with that at the beginning. Approximately 30 per cent showed a definite reduction of 6 to 20 beats per minute; 90 per cent of the patients had pulse rates between 65 and 80 per minute at the start so no striking change could be expected. An average of the differences between the pulse rates taken before and after the daily bath showed that in 98 per cent of the patients a reduction in the rate occurred.

Regulation of blood pressure, either high or low, with a return toward the normal level will frequently take place. In patients with a lowered pressure due either to myocardial weakness or to nervous exhaustion, moderate increases are found. In idiopathic hypotension, little change has been observed. In 52 patients of the group mentioned above whose systolic pressure was over 150 mm. Hg. at the start, 27 showed a reduction of more than 10 mm. Hg. with a maximum drop of 42 mm. Hg., 19 patients showed a change of less than 10 mm. Hg. and 6 showed slight increase of the pressure. No general conclusion can be drawn from this small series, but a definite reduction was observed in approximately one-half of the group.

Roentgenograms taken before and after a course of baths show in some patients a definite reduction in the size of the heart shadow. The electrocardiogram may reveal a change from abnormal to normal rhythm, a turning of an inverted T-wave to the upright position and the disappearance of heartblock in a rare case.

The results obtained give evidence that there is a definite indication for a course of carbonated baths in patients with moderate myocardial weakness, convalescence from rheumatic endocarditis, angina pectoris, arteriosclerosis, coronary thombosis (six to twelve months after the acute attack), variations in blood pressure, and neuroses with circulatory symptoms. The contraindications for a course of treatment include acute or severe decompensation, advanced syphilitic heart disease, severe paroxysmal dyspnea, and acute endocarditis with fever.

In conclusion, one must stress the very great value of regular living during the course of treatment, including regular meals, regular rest periods, regular exercise, and relaxation, both mental and physical, due to being away from one's work amid pleasant surroundings with good music. Attention must also be given to good elimination, regulation of weight by dietary control, and the avoidance of alcohol and tobacco in excess. All of these factors must be considered in any well rounded program. Balneotherapy, properly prescribed and administered, is taking its place with the standard methods of treatment of circulatory disorders.

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Book Reviews

ULTRA-VIOLET THERAPY IN EYE DISEASE. With a Review of the Action of Other Forms of Radiant Energy. By Frank W. Law, M.A., M.D., B. Chir., F.R.C.S., Assistant Surgeon, Central London Ophthalmic Hospital; Ophthalmic Surgeon, Paddington Green Children's Hospital and the West Middlesex Hospital; Pathologist and Curator and Medical Officer in charge of the Physico-Therapeutic Department, The Royal London Opthalmic Hospital. Foreword by Sir Stewart Duke-Elder, M.A., D.Sc., M.D., Ph.D. Boards. Price 5/. P. p78. London, John Murray, 1934.

This is a brief and excellent review of the action of radiant energy in eye disease, the majority of the monograph being devoted to the consideration of the therapeutic action of ultra-violet radiation in ophthalmic disorders.

General ultra-violet radiation, the author believes, is a useful adjunct in the treatment of such cases as phlyctenular disease, blepharitis and some forms of iridocyclitis. The clinical records of its use in 225 cases are given, its value indicated, and the results of other workers compared.

Local ultra-violet radiation, he states, is of the utmost value in the treatment of all kinds of superficial lesions of the eye. In corneal lesions, he believes, that the resultant scar is certainly more stable than if photo-therapy is not employed; it has no effect on nebulae, nor any considerable bactericidal action upon the conjunctiva.

There is a short discussion of the properties of radium and x-rays and of their pathological action upon the eye. The experimental and clinical research is reviewed. In a brief chapter on infra-red rays it is stated that infra-red radiation serves no therapeutic purpose in ophthalmic disorders. These rays have pathogenic effects which are usually encountered as an occupational disease in persons whose work entails the exposure of the eye to very hot bodies, such as glass workers and iron-founders.

FLUORESCENSE ANALYSIS IN ULTRA-VIOLET LIGHT. By J. A. Radley, B.Sc., A.I.C., and Julius Grant, Ph.D., M.Sc., F.I.C. Volume 7, Series of Monographs on Applied Chemistry. Editor, E. Howard Tripp, Ph.D. Cloth. Pp. 219. New York. D. Van Nostrand Company, Inc. 1933.

This is the first extensive compilation of work in this subject. Part I considers the theory and technique of fluorescence analysis. Part II gives the applications of fluorescence analysis in agriculture, bacteriology, botany, industry, drugs, foods, legal work, medical and biological sciences.

The authors emphasize that in practically every branch of fluorescence analysis, although the fluorescence test gives very valuable evidence, the results of the test must be taken in conjunction with other physical and chemical tests before a reliable decision can be made.

On page 52 are found detailed directions involving time of exposure for photographing objects in ultra-violet. It would seem that the intensity and character of the light source would have something to do with this, and while these specific directions might be good for the mercury lamp the authors have in mind, they might not apply to all photographic work in ultra-violet. The book is written in such a way that the impression is gained that the quartz mercury lamp is the only lamp available for this purpose, and the expression "the lamp" occurs frequently. On page 10 there is a brief reference to a carbon arc, and on pages 89 and 99 there occur references indicating that other and sometimes superior results are obtained if the carbon arc is used, but except for these brief references the carbon arc and other ultra-violet sources are ignored.

This book fills an urgent need for an up-to-date volume which will guide the practical worker through the labyrinth of scientific papers on the subject, many of which are contradictory or too vague to be of real use. There is an almost complete list of references to articles on the subject, nearly 800 in all. This book is an important contribution, and should stimulate investigation and application of fluorescence analysis in the diagnosis and treatment of disease.

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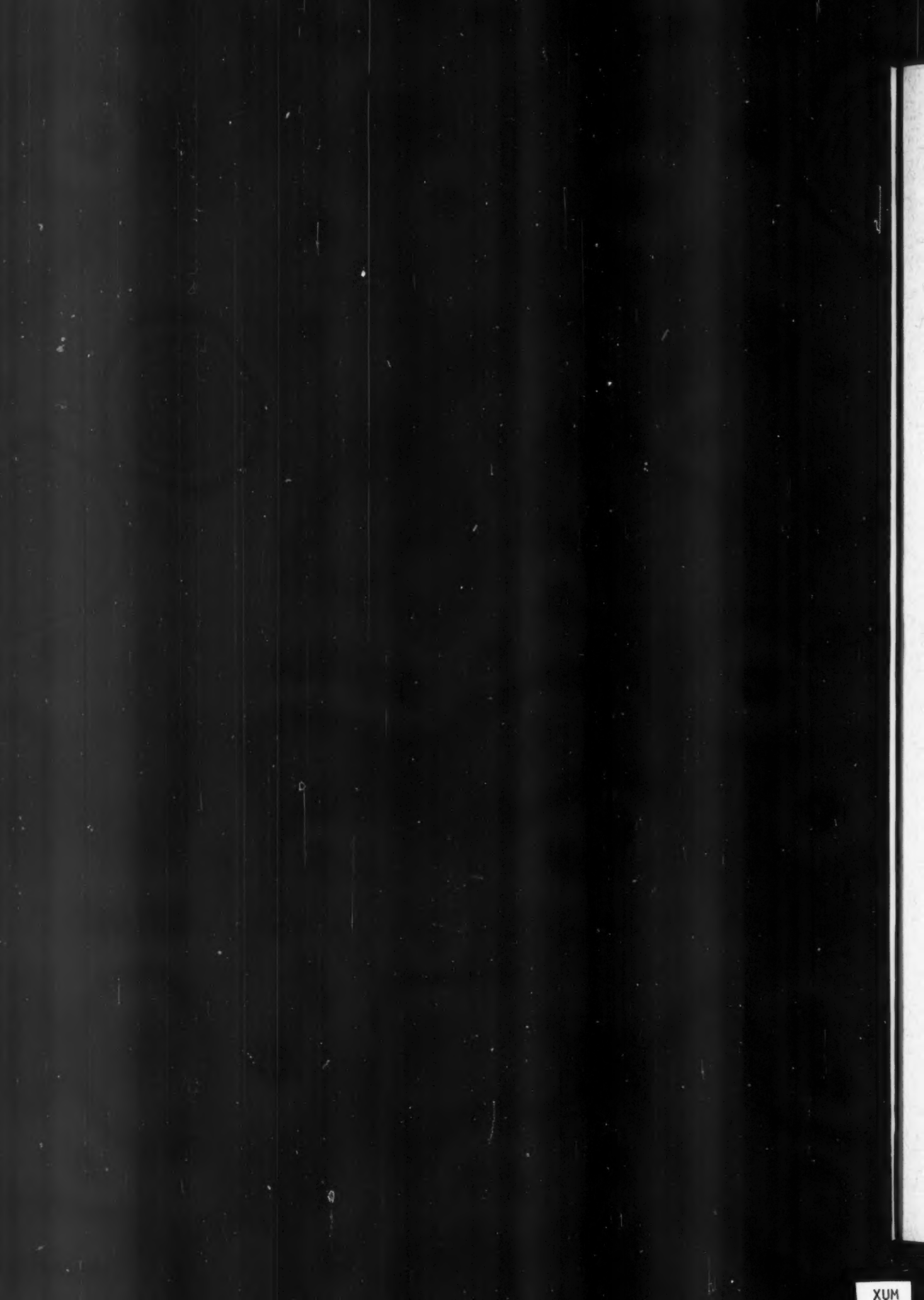

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